979

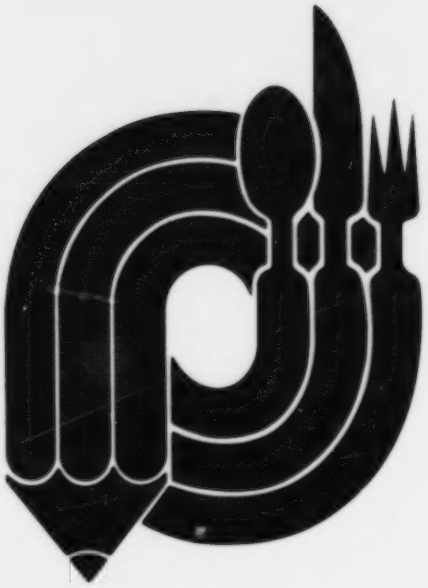
NEWARK PUBLIC LIBRARY

AUG 3 1981

U. S. GOVT. PUBS.
DEPOSITORY 376

Annual Report of the
National Institutes of Health

PROGRAM IN BIOMEDICAL AND BEHAVIORAL NUTRITION RESEARCH AND TRAINING FISCAL YEAR 1979



NIH Nutrition
Coordinating Committee

U.S. DEPARTMENT OF
HEALTH AND HUMAN SERVICES
Public Health Service
National Institutes of Health

HE 20. 3036:

Annual Report of the

National Institutes of Health

PROGRAM IN BIOMEDICAL AND BEHAVIORAL NUTRITION RESEARCH AND TRAINING

Fiscal Year 1979

Prepared by:

NIH Nutrition Coordinating Committee
Building 31, Room 4B59
National Institutes of Health
Bethesda, Maryland 20205
(301) 496-9281

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service o National Institutes of Health

NIH Publication No. 81-2092
June 1980

National Institutes of Health

NUTRITION COORDINATING COMMITTEE*

Officers	
Chairman	Artemis P. Simopoulos, M.D.
Vice Chairman	Robert Edelman, M.D.
Members and (Alternates)	
Division of Research Resources	William R. DeCesare, M.D. (Eric A. Elliot, M.D.)
Division of Research Services	Joseph J. Knapka, Ph.D.
National Cancer Institute	Diane Fink, M.D.
National Eye Institute	Carolyn McHale (Ralph Helmsen, Ph.D.)
National Heart, Lung, and Blood Institute	Basil M. Rifkind, M.D. (Helene N. Guttman, Ph.D.)
National Institute on Aging	Barbara Gastel, M.D. (Michael Dieter, Ph.D.)
National Institute of Allergy and Infectious Diseases	Robert Edelman, M.D. (Alfred M. Webb, Ph.D.)
National Institute of Arthritis, Metabolism, and Digestive Diseases	Gerald Combs, Ph.D. (John G. Bieri, Ph.D.)
National Institute of Child Health and Human Development	Gilman D. Grave, M.D. (Thorsten Fjellstedt, Ph.D.)
National Institute of Dental Research	Paul D. Frazier, D.D.S., Ph.D. (Matthew Kinnard, Ph.D.)
National Institute of Environmental Health Sciences	Wilford L. Nusser, Ph.D. (Carol M. Schiller, Ph.D.)
National Institute of General Medical Sciences	Emilie A. Black, M.D.

*(Alternates in Parenthesis)

National Institute of Neurological and Communicative Disorders and Stroke	Zekin Shakhashiri, M.D. (Alfred Weissberg)

NIH Liaison Representatives

Clinical Center	Elaine Offutt (Edith Jones)
Division of Computer Research and Technology	Penny Brogan (Arnold Pratt, M.D.)
Division of Legislative Analysis	Anne Houser
Division of Research Grants	John Schubert, Ph.D. (Julius A. Currie, Ph.D.)
Fogarty International Center	Earl Chamberlayne, D.V.M.
National Library of Medicine	Harold Schoolman, M.D.
Office of Communication	Marc Stern (Tom Flavin)

PHS, Department, and Other Liaison

Alcohol, Drug Abuse, and Mental Health Administration	Ellen Stover, Ph.D
Center for Disease Control	Milton Nichaman, M.D.
Food and Drug Administration	Allan Forbes, M.D. (John Vanderveen, Ph.D.)
Health Resources Administration	Louis Steinberg, Ed.D.
National Center for Health Statistics	Robert Murphy
National Institute of Alcohol Abuse and Alcoholism	Albert Pawlowski, Ph.D.
National Institute of Mental Health	Marian Yarrow, Ph.D.
Office of the Assistant Secretary for Health	J. Michael McGinnis, M.D.
Office of Science and Technology Policy, Executive Office of the President	Denis Prager, Ph.D.

READEX

PROGRAM IN BIOMEDICAL AND BEHAVIORAL NUTRITION RESEARCH AND TRAINING, FY'79

Table of Contents

Page

PREFACE 1

I. PROGRAM IN BIOMEDICAL AND BEHAVIORAL NUTRITION RESEARCH AND TRAINING 5

A. DEFINITION OF NUTRITION RESEARCH..... 5

B. NUTRITION POLICY OF THE NIH..... 5

C. DATA RETRIEVAL IN NUTRITION..... 7

D. FINANCIAL OBLIGATIONS IN NUTRITION..... 8

E. EXTRAMURAL RESEARCH PROGRAM.....15

F. INTRAMURAL RESEARCH PROGRAM.....18

G. NUTRITION RESEARCH TRAINING.....22

1. Extramural Training.....23

2. Intramural Training.....25

H. MANPOWER DEVELOPMENT IN EXTRAMURAL NUTRITION RESEARCH.....26

1. Research Career Development Awards.....26

2. Other Award Programs.....27

II. SPECIAL INTEREST AREAS IN NUTRITION 29

A. Nutrition and Prevention of Disease.....32

B. Nutrition and Genetics.....34

C. Behavioral Studies in Nutrition.....36

D. International Research in Nutrition.....38

E. Epidemiological Research in Nutrition.....40

Page

F. Nutrition and Obesity.....42

G. Nutritional Status.....44

H. Nutrition and Aging.....48

I. Child and Infant Nutrition.....49

J. Maternal Nutrition.....50

K. Total Parenteral and Enteral Nutrition.....51

L. Nutrition Education for the Public.....53

M. Nutrition Education for Professionals.....57

N. Nutrition Education Research 61

III. NUTRITION COORDINATING COMMITTEE.....65

A. COMMITTEE STRUCTURE.....65

B. MANDATE OF THE NUTRITION COORDINATING COMMITTEE.....65

C. NCC SUBCOMMITTEES.....67

D. COMMITTEE ACTIVITIES AND ACCOMPLISHMENTS IN FISCAL YEAR 1979.....68

1. Highlights Of The FY'79 Nutrition Program.....68

IV. NCC OFFICE 77

A. ACTIVITIES OF THE NCC OFFICE.....77

1. Congressional Hearings, Reports, and Special Presentations on Nutrition.....77

2. Foundation for Advanced Education in the Sciences.....80

3. Science Writers Seminar in Nutrition.....80

4. Politics of Nutrition and Public Health.....80

5. HealthWorks'79.....81

6. NCC Office-Clinical Center Study on the Follow-up of Hypochloremic Formula Feedings in Infants 82

Page

7. WHO/FAO Meetings.....83

8. DHHS Nutrition Coordinating Committee.....83

9. The Joint Subcommittee on Human Nutrition Research (JSHNR) of the Federal Coordinating Council for Science, Engineering and Technology (FCCSET), Office of Science and Technology Policy (OSTP), Executive Office of the President.....84

10. DHHS Health Research Plans and Initiatives...Nutrition Research Initiative.....85

V. APPENDICES 87

A. NUTRITION EXPENDITURES BY INSTITUTE AND DIVISION--FY'79.....87

B. MISSION STATEMENTS OF THE INSTITUTES AND DRR.....101

C. LEGISLATIVE AUTHORITY OF NIH FOR HUMAN NUTRITION RESEARCH.....107

PREFACE

The National Institutes of Health is the major agency in the Federal Government that supports research and training in nutrition as it relates to health maintenance, human development throughout the life cycle, disease prevention, and disease treatment. The NIH program in Biomedical and Behavioral Nutrition Research and Training is supported by all 11 Institutes and one Division, namely:

NCI	-	National Cancer Institute
NEI	-	National Eye Institute
NHLBI	-	National Heart, Lung, and Blood Institute
NIA	-	National Institute on Aging
NIAID	-	National Institute of Allergy and Infectious Diseases
NIAMDD	-	National Institute of Arthritis, Metabolism, and Digestive Diseases
NICHD	-	National Institute of Child Health and Human Development
NIDR	-	National Institute of Dental Research
NIEHS	-	National Institute of Environmental Health Sciences
NIGMS	-	National Institute of General Medical Sciences
NINCDS	-	National Institute of Neurological and Communicative Disorders and Stroke
DRR	-	Division of Research Resources

The NIH Nutrition program is coordinated through the NIH Nutrition Coordinating Committee (NCC), which consists of representatives from the 11 Institutes and the Division that support nutrition research, as well as additional NIH offices and liaison members from other agencies within the Public Health Service, from the Office of the Assistant Secretary for Health, and from the Office of Science and Technology Policy in the Executive Office of the President, the White House.

The NIH nutrition program includes extramural and intramural research and research training, and research manpower development. The major component of the NIH nutrition program is the extramural research program carried out at various universities, in graduate science departments principally

departments of nutrition, and in medical, dental and other health professional schools, especially schools of public health. The NIH intramural program in nutrition research is carried out on the NIH campus in Bethesda, primarily at the Clinical Center, with the exception of the programs of two Institutes: The Intramural program of the National Institute on Aging is carried out at the Gerontology Research Center in Baltimore, Maryland, while that of the National Institute of Environmental Health Sciences is located in Research Triangle Park, North Carolina.

Nutrition is an important, cross-cutting program area within the NIH. For this reason, the nutrition program is coordinated through the NIH Nutrition Coordinating Committee that operates out of the Office of the Director and is advisory to the Director. The mandate of the Nutrition Coordinating Committee is to stimulate, encourage, and review the necessary support of nutrition research and training in order to better define the role of nutrition in the promotion of health, and the prevention and treatment of disease. As one of the Committees that oversees selected "trans-NIH health problems", the Nutrition Coordinating Committee meets annually (or as required) with the Director, NIH to review progress and plans in nutrition research.

The Committee is the focus for the review of nutrition research priorities and training, their coordination, and for the development of the NIH program in biomedical and behavioral nutrition research and training. This focus minimizes duplication of effort among the Institutes and identifies areas where research, research training, and research manpower development in nutrition need to be advanced. This is accomplished through joint Program Announcements and Requests for Applications developed by the Committee and sponsored by more than one Institute. Committee representatives are also encouraged to have their individual Institutes develop Program Announcements, Requests for Applications, and Requests for Proposals.

The Committee plays a key role in the development of nutrition policy at the NIH. Currently, nutrition policy at the NIH emphasizes eight critical areas. Research is emphasized in four of these critical areas: Clinical Nutrition Throughout The Life Cycle; The Role of Nutrition in Disease Development; Prevention of Disease; and Treatment of Disease. The other four critical areas are the Transfer of Modern Nutrition Technology; Nutrition Education For Professionals and the Public; Nutrition Research Training and Research Manpower Development in Nutrition; and the Coordination of all these activities.

Each year, the NCC prepares the Annual Report of the NIH Program in Biomedical and Behavioral Nutrition Research and Training for the preceding fiscal year and sponsors a major conference or workshop in nutrition that includes the interests of many Institutes. The proceedings of this conference are published and made available to interested parties. In addition to coordinating the NIH nutrition program, the NCC Office staff is also assigned additional responsibilities that include responding to requests for information on nutrition from Congress and from other Federal agencies.

FY'79 marked the beginning of a new National Program in Clinical Nutrition Research through the funding of four Clinical Nutrition Research Units (CNRUs). Additional CNRUs will be funded in FY'80. As in previous years the NCC and relevant Institutes expanded nutrition research through the publication in the NIH Guide for Grants and Contracts of four Program Announcements, two Requests for Applications and three Requests for Proposals. This represents a threefold increase from the four items published last year. The NCC Office contributed to four major exhibits in the Nutrition Tent of "HealthWorks '79"; of these, the sing-along "Grocery Group" was most popular. State and county health departments, and private organizations across the country have used the lyrics and the costumes of the "Grocery Group" and have put on "the show" using local talent.

The Chairman of the Nutrition Coordinating Committee has been designated by the Secretary of the Department of Health, and Human Services, formerly DHEW, as the "initiative coordinator" for a proposed health research initiative on nutrition research. The purpose of the nutrition research initiative is to develop a cohesive program for DHHS in nutrition research and training so that the precise role of nutrition in health and disease can be defined and that appropriate mechanisms emerge for the presentation and proper management of disease. The health research initiatives are experiments in cooperative research planning and implementation by DHHS Agencies and represent efforts to strengthen research through cooperative planning and information exchange on a continuing basis.

Part I of the Report describes the NIH Program in Biomedical and Behavioral Nutrition Research and Training. Special sections of the program include the Definition of Nutrition Research at the NIH, the Nutrition Policy of the NIH, and the Data Retrieval System. The program is presented in terms of the financial obligations in nutrition by category of support; followed by narrative descriptions of the extramural research program, the intramural research program, nutrition research training, and manpower development in extramural nutrition research.

Part II includes detailed descriptions of the current research in the following fourteen Special Interest Areas: Nutrition and Prevention of Disease; Nutrition and Genetics; Behavioral Studies in Nutrition; International Research in Nutrition; Epidemiological Research in Nutrition; Nutrition and Obesity; Nutritional Status; Nutrition and Aging; Child and Infant Nutrition; Maternal Nutrition; Total Parenteral and Enteral Nutrition; Nutrition Education for the Public; Nutrition Education For Professionals; and Nutrition Education Research.

Part III of the Report describes the NIH Nutrition Coordinating Committee--its structure, and mandate, presents the charge of the Program Subcommittee and the charge of the Subcommittee on Nutrition Education, describes the mechanisms for program development; and highlights the Committee's activities and accomplishments in FY'79.

Part IV describes the major responsibilities and activities of the NCC Office. These activities encompass: information requests about nutrition in general and about the NIH nutrition program in particular from the Congress, other Federal Agencies, the scientific community and the

public; the NCC Office participation in the graduate school at the NIH sponsored by the Foundation for Advanced Education in the Sciences, the Science Writers Seminar in Nutrition, the "Politics of Nutrition and Public Health" session of the NIH Staff Training Extramural Programs (STEP) Module No. 4 on "The Politics of Health: 1979 Update", and HealthWorks'79; the Clinical Center Intramural Research Study of Infants with Hypochloremic Metabolic Alkalosis secondary to the feedings of chloride deficient formulas; international nutrition activities with the Food and Agricultural Organization of the United Nations and the World Health Organization; NCC Office participation in the activities of the DHHS Nutrition Coordinating Committee and the Subcommittee on Nutrition Research and Research Training, and the Joint Subcommittee on Human Nutrition Research (JSHNR) of the Committee on Health and Medicine (CHM) and the Committee on Food and Renewable Resources (CFRR) of the Federal Coordinating Council for Science, Engineering and Technology (FCCSET), Office of Science and Technology Policy (OSTP) in the Executive Office of the President, the White House; and the DHHS Health Research Plans and Initiatives, particularly the Nutrition Research Initiative.

The three Appendices to the Report include the following: A) The FY'79 Institute and Division Nutrition Expenditures by support mechanism; B) The Mission Statements in Nutrition of the NIH Institutes and the Division of Research Resources; and C) The Legislative Authority of NIH for Human Nutrition Research.

As in previous years, the NIH efforts to support high quality nutrition research and training will continue as part of its commitment to unveil new nutrition information based on sound scientific evidence and to impart this information to physicians, other health professionals, and the public.

Artemis P. Simopoulos, M.D.

Artemis P. Simopoulos, M.D.
Chairman, Nutrition Coordinating Committee
Office of the Director
National Institutes of Health

I

PROGRAM IN BIOMEDICAL AND BEHAVIORAL NUTRITION RESEARCH AND TRAINING

At the National Institutes of Health, the biomedical and behavioral nutrition research and training program is coordinated through the Nutrition Coordinating Committee (NCC). One of the early accomplishments of the NCC in FY'77 was to develop the definition of nutrition research. The definition serves as a basis for data retrieval and compiling information about the biomedical and behavioral nutrition research and training activities of the NIH.

DEFINITION OF NUTRITION RESEARCH AT THE NIH

The NIH Nutrition Coordinating Committee has defined biomedical and behavioral nutrition research as follows:

> "The term nutrition research includes studies designed to assess the consequences of food or nutrient intake and utilization in the intact organism, including man, and the metabolic and behavioral mechanisms involved. These studies encompass investigation of nutrient variables at the cellular or subcellular level. This definition also includes:
>
> - Research designed to elucidate the metabolic role or function of nutrients in both animal models and man.
> - All studies concerned with genetic-nutrient-environmental interactions where a nutrient is a variable.
> - Dietary studies expected to produce significant changes in health status, including the maintenance of health and the treatment of disease in man. Such studies might include clinical trials, epidemiological studies, metabolic studies, surveillance, and nutritional status monitoring studies."

NUTRITION POLICY OF THE NIH

Policy Objectives:

The NIH supports DHHS policy by sponsoring and conducting biomedical research designed to improve the quality of life for all Americans through optimal nutrition. Basic biomedical nutrition research will develop knowledge needed to promote and maintain health, as well as to prevent and treat disease.

Nutrition research has passed through two stages and is now entering a third. The first stage saw the discovery of vitamins and the development of many of the basic nutritional requirements. The second stage reduced nutrition to subcellular and molecular terms within areas of biochemistry and physiology. The third stage calls for a synthesis of newer findings for translation into practical information to assist the individual to develop normally, to avoid disease, and to live as long and as healthy a life as possible. For this third stage, knowledge is needed that will permit distinction among individuals in terms of genetic differences that affect dietary requirements.

Areas of Emphasis:

Current nutrition research at NIH concentrates on eight critical areas:

1. Clinical Nutrition Throughout the Life Cycle: Research in this initial area examines variations in nutritional requirements to promote and maintain health during all phases of the life cycle. Within the clinical nutrition program, research is also directed towards elucidating the effects of infant feeding practices and infant nutrition on subsequent physiological, immunological, and mental development. Another research goal involving the life cycle is to understand the effects of maternal nutritional status and maternal diet before and during pregnancy on the development of the fetus. In order to understand the ramifications of this nutritional problem, more must be learned about the interaction between the genetic makeup of an individual and his dietary intake. Special emphasis is given to studies on the role of nutrition in health of the aged and aging process, particularly the effects of aging on nutrient utilization, digestion, absorption, and metabolism, and nutrition and age-related mental deterioration.

2. Role of Nutrition in Disease Development: The NIH conducts research on mechanisms by which dietary deficiencies, imbalances, and excesses lead to the development of physical and mental diseases and disorders.

3. Prevention of Disease: The NIH has assumed a leading role in shifting the emphasis in nutrition research from curing disease after symptoms have developed to preventing or delaying the onset of disease. Continued research emphasis is given to malnutrition in all its guises, including under- and over-nutrition, obesity, food faddism, and specific dietary deficiencies.

4. Treatment of Disease: The NIH develops nutritional therapies for specific diseases, such as cancer, gastrointestinal disorders, obesity, osteoporosis, renal insufficiency, atherosclerosis, and inborn errors of metabolism. Improved methods are being developed to provide general nutritional support for newborns of low birth weight who may require parenteral supplementation and for elderly, disease-ridden, traumatized, or post-operative patients who may require total parenteral nutrition or elemental diets.

5. Technology Transfer: An important component of the NIH nutrition policy is to assure appropriate application of research in practice. To expedite transfer of nutrition technology, the NIH is establishing mechanisms to evaluate research data relevant to nutrition and public health.

6. Nutrition Education: The NIH continues to support research in nutrition education as by-products of clinical trials and demonstration projects; by the education of the physician through professional societies, scientific meetings, and journals; and by the production of nutrition education materials for the health educator and the public. Encouragement of positive nutrition behavior is an obvious task for educators of children, young adults, and the elderly.

7. Research Training: The NIH encourages and supports the teaching of modern biochemical nutrition at the pre- and post-doctoral levels. This training includes the disciplines upon which nutrition research is based, such as gastroenterology, endocrinology, metabolism, developmental biochemistry, genetics, and molecular biology. The NIH also promotes expanded training programs in basic and clinical nutrition research aimed principally at the physician investigator and clinically oriented biomedical scientists.

8. Coordination: The NIH cooperates in establishing mechanisms for interagency coordination. Nutrition research at the NIH is coordinated through the Nutrition Coordinating Committee. Institutes initiate their own nutrition programs within their appropriated budgets. The Committee seeks agreement on critical issues of definition, comments upon individual programs identified to it, maintains an information exchange (mechanisms for program development), promotes liaison with other Federal agencies, and encourages coordinated program planning among Institutes and with other appropriate agencies. The Committee assists in the development of nutrition data retrieval systems, and reviews legislative and regulatory initiatives that impact upon human nutrition research.

DATA RETRIEVAL IN NUTRITION

Using the definition of nutrition research as the criterion, the Institutes program staff reviews all research and training projects in order to identify those projects with a nutrition component, and then determines the percentage of the project applicable to nutrition. The nutrition obligations are computed from this percentage and the total obligation committed to each project. The NIH has thus been able to eliminate such confusing and easily misunderstood terms as "primary/secondary," "major/ minor," "nutrition related" and "direct/indirect" in referring to its nutrition program.

This year, for the first time, the NCC Office has developed a computer aided system for the storage and retrieval of information on all nutrition research grants, program projects, contracts, centers, reimbursement agreements, research training ,and manpower development activities of

the NIH programs. The data-base is updated periodically so that nutrition research and training activities at the NIH are up-to-date. When this computer retrieval system is completed, it will assist the NCC Office to expeditiously develop reports on each Institute's nutrition program, and on the overall NIH Program in Biomedical and Behavioral Nutrition Research and Training, and to promptly respond to requests for special compilations of program information.

FINANCIAL OBLIGATIONS IN NUTRITION

The financial obligations for the NIH Program in Biomedical and Behavioral Nutrition Research and Research Training for FY'79, are presented in Table I. As can be seen from Table I the extramural program is classified by category of support mechanism into Regular research grants, Program Projects, Contracts, and Centers. Clinical Trials are funded by all four mechanisms mentioned thus far. General Research Support, Reimbursement Agreements, Training (Training Grants and Fellowships), Research Career Development Awards, and New, Young and Academic Investigator Awards are also included in the extramural program. The intramural program consists of Research Projects and Training (fellowships).

The table also includes information on the number of projects for each category of support, the number of persons being trained, and FY'79 obligations* for each category. The total obligations for extramural research, training, and manpower development in nutrition are $126,597,000 for FY'79. The total obligations for intramural research and training are $7,255,000. For FY'79, NIH obligations for the NIH Program in Biomedical and Behavioral Nutrition Research and Training totaled $133,852,000.

Table II provides a perspective on NIH obligations in nutrition, presenting data on the NIH Program in Biomedical and Behavioral Nutrition Research and Training for FY'77, FY'78, and FY'79.

---

* Since the dollar figures have been rounded to the nearest thousand dollars, comparisons of the various tables may reveal slight differences in the totals due to the accumulation of rounding errors.

Table I

National Institutes of Health
BIOMEDICAL AND BEHAVIORAL NUTRITION RESEARCH AND TRAINING -- FY '79
(in thousands of dollars)

Item		Breakdown Number	Breakdown Cost	Total Number	Total Cost
Extramural					
Research grants:	Regular	1,075	$ 56,867		
	Clinical trials	25	3,816		
	Total			1,100	$ 60,683
Program projects:	Regular	61	9,700		
	Clinical trials	4	262		
	Total			65	9,962
Contracts:	Regular	131	12,350		
	Clinical trials	69	12,405		
	Total			200	24,755
Centers:	Regular	85	11,976		
	Clinical trials	6	59		
	Total			91	12,035
General research support					13,427
Reimbursement agreements				11	1,142
Training:	Training grants	261*	2,556		
	Fellowships	36*	467		
	Total			297*	3,023
Research career development awards				30*	1,063
New, young, and academic investigator awards				18*	507
Subtotal - Extramural					$126,597
Intramural					
Projects				49	$ 6,241
Training				41*	1,014
Subtotal - Intramural					$ 7,255
TOTAL NUTRITION RESEARCH AND TRAINING - NIH					$133,852

*Number of persons.

Table II

National Institutes of Health
BIOMEDICAL AND BEHAVIORAL NUTRITION RESEARCH AND TRAINING,
FY'77, FY'78, FY'79
(in thousands of dollars)

	FY'77 TOTAL		FY'78 TOTAL		FY'79 TOTAL	
	Number	Cost	Number	Cost	Number	Cost
Extramural						
Research grants	839	$ 38,337	809	$ 44,586	1,100	$ 60,683
Program projects	45	8,928	52	7,316	65	9,962
Contracts	122	16,030	137	20,467	200	24,755
Centers	54	9,525	64	9,232	91	12,035
General research support		10,000		13,210		13,427
Reimbursement agreements	3	460	9	881	11	1,142
Training	182*	2,061	169*	2,419	297*	3,023
Research career development awards	24*	728	37*	1,129	30*	1,063
New, young, and academic investigator awards	6*	179	11*	343	18*	507
Extramural Subtotal		$ 86,248		$ 99,583		$126,597
Intramural						
Projects	64	6,456	79	6,047	49	6,241
Training	23*	642	31*	668	36*	1,014
Intramural Subtotal		$ 7,098		$ 6,715		$ 7,255
NIH TOTAL NUTRITION RESEARCH AND TRAINING		$ 93,346		$106,298		$133,852

*Number of persons

Total obligations in nutrition research and training for each Institute and the DRR are presented in Table III and Figure 1. Appendix A (Tables A-1 through A-12) present this information by category of support for each Institute and DRR.

Table III
NIH NUTRITION OBLIGATIONS FOR FY'79 BY INSTITUTE AND DIVISION
(in thousands of dollars)

NCI	$ 28,303
NEI	3,565
NHLBI	28,415
NIA	2,628
NIAID	1,205
NIAMDD	25,068
NICHD	20,806
NIDR	1,663
NIEHS	3,540
NIGMS	2,971
NINCDS	2,306
DRR	13,381
Total	$133,852

Figure 1 shows the FY'79 nutrition obligations of each Institute and DRR in millions of dollars.

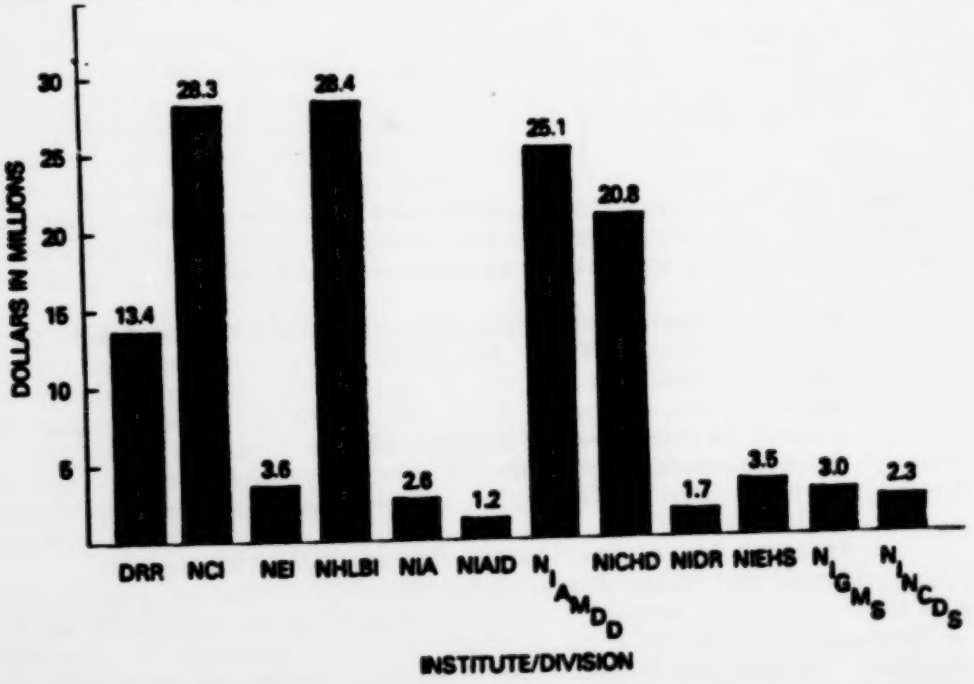


Figure 1
NIH NUTRITION OBLIGATIONS FOR FY'79
(millions of dollars)

The total NIH obligation for research grants, research training and manpower development, research and development contracts, and intramural research in FY'79 was $2,850,780,000. The total obligation of the NIH Program in Biomedical and Behavioral Nutrition Research and Training, $133,852,000 is 4.7 percent of the NIH total.

Table IV gives the total NIH FY'79 extramural obligations as well as the nutrition obligations in three categories: research grants and program projects, centers, and contracts. The nutrition obligations are also presented as a percentage of the NIH total in each category.

Table IV

COMPARISON OF EXTRAMURAL NUTRITION OBLIGATIONS WITH NIH TOTALS
Actual Obligations
(in thousands of dollars)

	NIH Total		Nutrition		Percent of NIH Total
Research grants and program projects	1,403,068	(65%)	70,645	(66%)	5.0
Contracts	431,176	(20%)	24,755	(23%)	5.4
Centers	332,778	(15%)	12,035	(11%)	3.6
TOTAL	2,167,022	(100%)	107,435	(100%)	5.0

The categories of support in the extramural program are described below. NIH designates the various categories of support included in the nutrition research and training activities as follows:

Research Grants--R01, R07, R13, R18, R22, R25, and R26
Program Projects--P01
Contracts--N01
Centers--P30, P50
General Research Support--M01, S06
Reimbursement Agreements--Y01
Training Grants--T32
Fellowships--F32
Research Career Development Awards--K04, K06, and K07
New Investigator Research Awards--R23

Research grants support a discrete, specified, circumscribed project to be performed by the investigator(s) in areas representing specific interests and competencies. Such research is initiated entirely by investigators outside the NIH. In FY'79, the Institutes supported 1,100 research grants in nutrition for a total obligation of $60,683,000. This category constitutes the largest single area of support in nutrition.

Program projects are also investigator-initiated research, but differ from research grants in that they are awarded for the support of a broadly based, multidisciplinary, often long-term research program that has a specific major objective or a basic theme. A program project generally involves the organized efforts of relatively large groups, whose members conduct research projects designed to elucidate the various aspects or components of the major objective. In FY'79, the NIH supported 65 program projects in nutrition at a total obligation of $9,962,000.

The total FY'79 obligation for investigator-initiated research in nutrition was $70,645,000 or 53 percent of the total FY'79 nutrition obligation. This investigator-initiated research in nutrition is 5.0 percent of the total NIH obligation of $1,403,068,000 for all investigator initiated extramural research.

Contracts are initiated by the agency to develop or apply new knowledge, or to test, screen, or evaluate a product, material, device, or component for use by the scientific community. In FY'79, the NIH had 200 contracts with nutrition research components in force for a total obligation of $24,755,000 or 5.4 percent of the total NIH obligations of $431,176,000 for research and development contracts.

Centers are an additional component of agency-initiated research, and may support any part of the full range of research and development from very basic to clinical. Centers may involve ancillary supportive activities, such as protracted patient care, necessary to the primary research effort. The spectrum of activities comprises a multidisciplinary attack on a specific disease entity or biomedical problem area. In FY'79, the nutrition obligations for the 91 centers with a nutrition component totalled $12,035,000. This figure is 3.6 percent of the total NIH obligations of $332,778,000 for research centers.

The total obligation for agency-initiated research support in nutrition (contracts and centers) was $36,790,000 for FY'79. This is 27.5 percent of the total nutrition obligation in FY'79 and 4.8 percent of the total NIH obligation of $763,954,000 in this category. For NIH as a whole, agency initiated research was 35 percent of the total extramural research obligation. Thus, consistent with the overall NIH support of research, the nutrition research supported in FY'79 was primarily investigator initiated.

Clinical trials in nutrition are supported by each of the four major mechanisms discussed above--research grants, program projects, contracts, and centers. A clinical trial is defined as a scientific research activity undertaken to define, prospectively, the effect and value of prophylactic/diagnostic/therapeutic agents, devices, regimens, procedures,

intervention of some sort must occur. The number of cases or patients depends on the hypothesis being tested, but must be sufficient to permit anticipation of a definite, statistically significant, result. Phase I, feasibility, or pilot studies are excluded by definition.

FY'79 obligations supporting 104 clinical trials in nutrition totalled $16,542,000. This obligation constitutes 12.4 percent of the total nutrition obligation for FY'79.

General Research Support is provided almost entirely by the Division of Research Resources (DRR). For FY'79, a total of $13,427,000 was assigned to this category of the NIH nutrition program. The DRR provides general research support through five mechanisms:

1. The General Clinical Research Centers Program, with obligations of $9,766,000 for nutrition in FY'79, constitutes the bulk of DRR general research support. These Centers foster the development of technological and therapeutic advances to expedite the application of basic biological knowledge into effective patient care.

The balance of $3,661,000 is provided through the following four mechanisms:

2. The Animal Resources Program provides a unique institutional research environment for the use of nonhuman primates or other animals in multicategorical research.

3. The Biomedical Research Support Program responds to emerging research opportunities and allows the supported institution self-determination in the development and conduct of pilot and other small projects.

4. The Biotechnology Resources Program attempts to interface the knowledge of the physical sciences, mathematics, and engineering with biology and medicine.

5. The Minority Biomedical Support Program provides funds to ethnic minority institutions to conduct research.

Interagency reimbursement agreements are entered into between the NIH and other Federal agencies. In FY'79, eleven such agreements were made in the area of nutrition, five by NCI and six by NHLBI:

NCI - "Research on CoCarcinogenesis" and "In Vitro Transformation of Epidermal Cells" with the Department of Energy at Oak Ridge National Laboratory; "In Vitro Quantification of Nitrogen by Whole Body Neutron Action" with the Department of Energy at Brookhaven National Laboratory in Upton, New York; "Diet and Nutrition, Genetically Distinct Animals and Carcinogenesis" with the National Center for Toxicological Research; and "Research on Occupational Carcinogenesis" with the National Institute of Occupational Safety and Health.

NHLBI - "Clinical Chemistry Standardization Laboratory for the Lipid Research Clinics Program," "Clinical Chemistry Standardization Laboratory for the International Lipid Research Clinics Program", "Clinical Chemistry Standardization Support to the Central Laboratory of the Hypertension Detection and Follow-up Program (HDPP)", and "Clinical Chemistry Standardization Laboratory to the Multiple Risk Factor Intervention Trial (MRFIT)" with CDC. "Acquisition and Compilation of Data on the Nutrient Composition of Food" and "Nutrient Composition Data for Cardiovascular Disease Research" with USDA.

The total obligation for reimbursement agreements in nutrition was $1,142,000 in FY'79.

EXTRAMURAL RESEARCH PROGRAM

Overall nutrition research at the NIH encompasses the effects of nutrients in human growth and development, health maintenance and promotion, disease prevention, and disease treatment. (Appendix C describes the Institutes' legislative authority for human nutrition research.) The primary nutrition mission of the NIH is in biomedical and behavioral research and training, however nutrition education for the public is an integral part of many programs. Consequently NIH provides pamphlets, Public Service Announcements on radio and television, and materials for magazine articles. Nutrition education for professionals is provided through various scientific publications, conferences, and workshops.

The role of nutrition in normal development and disease prevention during all stages of the life cycle, particularly infancy, childhood, adolescence, and old age, is a major portion of the extramural research carried out by NICHD and NIA. The NIAMDD, NIGMS, NIEHS, and DRR also support research on the role of nutrients on health promotion and on human growth and development throughout the life cycle.

In FY'79, the DRR supported seventy-five General Clinical Research Centers (GCRC's) in the United States. The research beds, laboratories, professional nursing, and dietary personnel that comprise each center are essential to clinical investigation in nutrition. These centers conduct clinical nutrition studies on obesity, diabetes, cancer, parenteral nutrition, hyperlipidemias, atherosclerosis, vitamins, and environmental health factors. In all, the dietary support personnel working in these centers number two hundred and forty five full time equivalent, while eight hundred interns are trained in these centers per year. Several of the forty three, currently funded, clinical associate physicians are directly involved in clinical nutrition research. The team approach in clinical investigation at the centers allows the basic scientist, clinician, dietitian, and nurse to interact in developing systematic methods for nutrition research.

The Diet, Nutrition, and Cancer Program (DNCP) of the NCI supports numerous research projects to elucidate the nature and mechanism of action of

suspected carcinogens as well as substances with anticancer properties such as vitamin A and its synthetic analogs. The development of nutritional assessment methods for application to patient populations is an essential part of the overall effort to improve the nutritional support of cancer patients. Major investigations are directed toward evaluating the efficacy of nutritional support procedures, particularly TPN, in preventing or treating malnutrition in cancer patients and in developing improved formulations and delivery systems for nutritional support. Another major effort of the DNCP is to develop and apply methods of prevention and treatment to such syndromes as anorexia, cachexia, and malnutrition common in patients with a variety of cancer disorders.

The NEI currently supports three clinical trials on the treatment of ocular diseases and disorders with vitamins. Protection against induced retinopathies, particularly retrolental fibroplasia, with Vitamin E is the subject of two clinical trials. The third clinical trial evaluates treatment of corneal disease with Vitamin C. Nutritional deficiencies, particularly Vitamin A deficiency, are worldwide causes of eye disease and blindness in children. NEI supports research on the underlying mechanisms that may lead to effective prevention. Gyrate atrophy, an inborn error of metabolism, has been identified as a deficiency of ornithine aminotransferase. Research on the role of Vitamin A in the development and functioning of the retina and cornea, and the possible role of various nutrients to cataract formation is also underway.

NHLBI investigations in the epidemiology, etiology, and prevention of all forms and aspects of heart, blood vessel, lung and blood diseases, include research into social, environmental, behavioral, nutritional, biological, and genetic determinants and influences. In addition, the Office of Prevention, Education, and Control places special emphasis on dissemination of information to professionals and the public regarding diet and nutrition as related to all aspects of the Institute's mission.

The NIA supports research on the effects of specific diseases, therapeutic agents, and medical procedures on the nutritional status of the elderly. Investigations on the effects of aging on nutrient utilization and the relationship to nutrient requirements consider factors regulating changes occurring in lean body mass, energy balance and other metabolic processes, and immune function. Another area of research interest is the relation of nutrition to age related mental deterioration or senile dementia with subsequent loss of neural function, and to the decline in the sensations of taste and smell, as well as to motor coordination and cognition.

Research interests of NIAID encompass the field of nutrition, infection and immunity. These interests focus on the modulating effect of specific nutrients on immune function, mechanisms of food allergies and immune response to ingested antigens, the interaction of nutrition and infection in the tropical environment and in American hospitals, and the modulating effects of specific nutrients on microbial virulence.

The NIAMDD continues to stress nutrition priorities that include study of human nutritional requirements, and factors that influence these requirements; use of new technologies in the study of function of nutrients; studies on iron deficiency; research on levels and metabolic roles

of trace minerals; basic studies on dietary fiber; research on the interaction of nutrition, immune competence, and infection; increased support for obesity research; and studies on nutritional support of hospitalized patients through Clinical Nutrition Research Units.

The NICHD supports nutrition research on the relationship of nutrition to reproduction; maternal nutrition; infant nutrition; nutritional antecedents of adult disease; behavioral and cultural aspects of nutrition and nutritional aspects of developmental gastroenterology. NICHD research is aimed at understanding how a mother meets the nutritional demands of her growing fetus as well as investigating the biochemistry and genetics of a variety of inborn errors of metabolism that are amenable to intervention by dietary means, such as galactosemia and phenylketonuria. Other work in the area of infant nutrition focuses on metabolic processes of neonatal adaptation and on the roles played by essential nutrients in optimizing early development, particularly in infants premature or small for gestational age.

Studies supported by NICHD on the nutritional aspects of developmental gastroenterology emphasize basic research on cellular differentiation in relation to the functional development of the intestine and specific absorption of trace elements and oligopeptides. In the area of nutritional antecedents to adult disease, research focuses on the development of obesity in infancy, childhood, adolescence and early adulthood. Nearly two million dollars were allocated by NICHD for a new program of studies on behavioral and cultural aspects of nutrition with new research contracts designed to increase knowledge of how children's nutritional environments and their food choices affect their nutritional status.

NIDR supports studies on the relationship between diet and disease, such as dental caries, and peridontal disease, as well as the role of nutrition on the development of hard and soft tissue of the oral facial complex. The efforts of the National Caries Program have focused on determining the cariogenic potential of various foods, developing non-cariogenic sweeteners and special diets to reduce caries, and the use of fluoride as an effective means in preventing caries.

The NIEHS supported research in nutrition focuses on the interactions between environmental contaminants and nutrients or dietary constituents in biological systems, and the alteration of these systems in order to prevent biological insult through decreased absorption or enhanced excretion. Other research deals with food toxicology and measuring and understanding the uptake, metabolism, and accumulation of toxicants in food crops and plants.

The extramural program of NIGMS is directed toward a better understanding of the biochemical and physiological changes induced by trauma, and the fundamental nutritional aspects of wound healing and biological repair.

The NINCDS nutrition activities attempt to clarify the two-way interaction between nutrient intake and the activity of the central nervous system with specific projects on behavior factors and neural control of food intake, the influence of nutrients on the onset or progress of neurological disorders, the metabolic effects of nutrients on hereditary metabolic

disorders that cause neurological abnormalities, the transport of nutrients and their metabolic products across the blood-brain and blood-cerebrospinal fluid barriers and the peripheral effects of drugs used in CNS disorders on the intake and utilization of nutrients.

In summary, the Institutes with mandates in categorical diseases support nutrition research programs in their areas of responsibility in both the prevention and the treatment of disease: namely the NCI on diet and cancer; NIDR on nutrition and dental caries; NHLBI on diet and heart disease and hypertension; and NEI on nutrition and various eye disorders, etc. The NIA, NIAMDD, NICHD support nutrition research particularly related to nutrient requirements relevant to the different stages of the life cycle and specific metabolic and genetic diseases. Through sophisticated studies in biochemistry, physiology, and cell biology, NIH-supported research aims at elucidating fundamental mechanisms and at synthesizing the results into practical information on nutrition and diet that will assist the individual to develop normally, and to live as long and as healthy a life as possible.

INTRAMURAL RESEARCH PROGRAM

As shown in Table I, obligations for intramural research in nutrition for FY'79 totalled $6,241,000.

The NIH intramural program in biomedical and behavioral nutrition research is carried out by the NCI, NEI, NHLBI, NIA, NIAMDD, NICHD, NIDR, and NIEHS. Most of this research program is conducted on the NIH campus in Bethesda. However, the NIA's intramural program is located at the Gerontology Research Center in Baltimore, and the staff of the NIEHS conducts research in Research Triangle Park, North Carolina.

The research projects include prospective randomized clinical studies; longitudinal studies in normal volunteers and patients with various disease states on the metabolism of nutrients and on food toxicity; and animal studies. As an illustration of the breadth of these activities, some of the studies are described below.

Ongoing long-term studies that continued during FY '79 are: the U.S. Cancer Mortality Survey where the role of nutrients in cancer mortality is an important component; studies on the effects of total parenteral nutrition in the treatment of cancer; and the longitudinal studies on human aging.

A substantial portion of research conducted intramurally focuses on the effects of nutrition on mental, physical, and psychological development. Obesity in childhood is being investigated to provide information on changed hormone levels or other changes that appear in obese children as opposed to normal weight children. Calcium balance studies in infants and children with unusual bone disorders now can make use of a new technique that employs non-radioactive substances, including calcium as tracers. Iron, chromium, and zinc metabolism is also under investigation since the presence or absence of a particular trace metal will drama-

tically change the uptake, need, or amount of another trace metal.

In other studies, methods of dietary management of glycogen storage disease, the inborn error of metabolism characterized by the inability of the liver to produce glucose, are being evaluated, as is the antioxidant potential of vitamin E within the cells of individuals with glutathione synthetase deficiency.

A large group of studies focuses on nutritional factors that relate to the etiology, morbidity, and mortality of metabolic and other diseases that occur throughout the life cycle. Of special significance are studies on: 1) the effects of obesity and eating patterns on insulin receptors and diabetes; 2) intestinal and hormonal factors that affect the regulation of digestion and the bioavailability and absorption of nutrients; 3) the role of obesity and diabetes on gall bladder disease, with special studies in American Indians; and 4) nutrition and cystic fibrosis.

Studies on the effects of nutrition on the aged and the aging process continue to receive considerable attention in the NIA intramural program. The Longitudinal Study on Human Aging conducted at the Gerontology Research Center in Baltimore is an intensive multidisciplinary study that includes evaluation of nutritional factors. These studies are aimed at assessing the role of controllable variables in the life history of the participants. More than 1,000 men have been studied, ranging in age from the early 20's into the 90's. Their return at 1- to 2-year intervals for 2-1/2-day examinations generate data that will permit an assessment of the role of nutrition in the development and prevention of age-associated diseases and in the rate of change with time in physical, physiological, biological, and intellectual function. In this longitudinal study, dietary information is being obtained using a 1-week diary technique. Computer technology permits the conversion of this type of information into detailed nutritional data on intake of calories, protein, fat, and carbohydrate; type of fatty acid and carbohydrate ingested; and vitamin and mineral consumption. Furthermore, since the same individuals are repeatedly studied, the effect of aging on dietary habits and the impact of psychosocial influences on nutritional preferences can be tracked.

In addition to these clinical studies, animal studies are underway on the relationship between nutrition and longevity. Results from studies relating the biochemical characteristics of animal tissues to several dietary regimens known to increase lifespan have supported a working hypothesis that an increased lifespan associated with reduced intake of dietary protein may be related to the rate of genetic transfer. Other biochemical studies attempt to: determine the nutritional, biochemical, and physiological roles of a variety of essential nutrients (vitamins A and E and trace minerals) with special emphasis on nutrient needs for optimal functioning of liver and small intestine; define the metabolic function of certain nutrients such as folic acid in enzyme reactions; study the effects in laboratory animals of nutrient intake and nutrient deficiencies on tissue levels of various metabolites, as well as naturally occurring carcinogens; and isolate and identify goitrogens naturally occurring in water sources for antithyroid activity. Other metabolic research encompasses: the role of gastrointestinal hormones, other intestinal factors, and pancreatic secretion in digestion;

the role of lingual lipase in digestion of fats; nutritional problems in cystic fibrosis; mineral metabolism; and the effect of obesity on cellular metabolism.

In addition, the intramural program includes environmental studies, specific research on cancer, coronary artery disease, dental caries and peridontal disease, and studies on the effects of nutrition on functions of the eye. This research is described below.

The possible interactive relationship between nutrients and environmental contaminants is being researched in both animal and human studies. The human studies focus on the health effects of possible exposure to low-dose environmental pollutants that can result in the polychlorinated biphenyl (PCB) contamination of breast milk. The animal studies include examination of the utility of pica as a behavioral assay of toxicosis, and investigations on the interaction between diet and food restriction on the neurobehavioral toxicity of acrylamide. Studies evaluate the effects of starvation, vitamin A deficiency, and excess food on the intestinal enzymes responsible for activation or inactivation of foreign chemicals. Other experiments are concerned with understanding the development of physiologic functions of the normal small intestine and the effects of environmental pollutants on these basic functions. Placental transfer rates of chemicals as well as their presence in milk have been of particular interest in perinatal toxicology and pharmacology studies.

A substantial number of projects in the intramural nutrition program are concerned with cancer etiology, treatment, chemo-prevention, and information dissemination. Intramural research is being carried out within the Division of Cancer Cause and Prevention (DCCP), the Division of Cancer Biology and Diagnosis (DCBD), and the Division of Cancer Treatment (DCT). A series of research efforts by the Environmental Epidemiology Branch of DCCP is seeking to determine the underlying causes and etiologic agents that determine an individual's susceptibility to cancer. This research includes studies of migrant populations such as the Japanese, Norwegian, Colombian, Polish, and studies of selected high-risk populations within the United States and Canada. Several carcinogenesis projects are also underway to investigate the potential of natural and synthetic retinoids to alter or reverse preneoplastic changes in epithelial tissue in specific organ sites such as skin, bladder, tracheobronchus, and lung *in vitro* and *in vivo*. Other studies are investigating the role of specific nutrients in carcinogenesis *in vivo* and *in vitro*.

Several multidisciplinary nutrition and cancer therapy studies are underway by the Surgery Branch of the DCT to investigate the role of total parenteral nutrition in the treatment of esophageal cancer and diffuse histiocytic lymphoma in adults, and of metastatic sarcomas in adolescents. The first prospective randomized protocol on the use of total parenteral nutrition (TPN) as an adjunct to aggressive chemotherapy and radiation therapy has been initiated. Patients receiving TPN are studied for deficiencies of vitamins, trace metals (zinc, copper, chromium), essential fatty acids, and for efficacy of TPN. Studies are performed on gluconeogenesis, protein synthesis, glucose disposal, body composition of potassium, alanine kinetics, and mineral balance. Studies in animal models and tissue culture are also being used to investigate the questions of

nutritional support, efficacy, and tolerance as they apply to the clinical situation. Attempts are being made to identify the cause of nutritional depletion and general deterioration of the host (cancer cachexia) with the hope of blocking or reversing such systemic effects so that a person can become more receptive to anticancer therapies.

At the NHLBI, the Division of Heart and Vascular Disease (DHVD) has a program of general laboratory and clinical research underway in heart, blood vessel, lung, and kidney diseases, and in certain blood diseases. The program also develops technology related to cardiovascular and pulmonary diseases. A major research activity is concerned with the biosynthesis, transport, and catabolism of plasma apolipoproteins and lipoproteins while another important area is directed toward the effect of dietary lipids on atherogenesis. The type II Coronary Intervention Trial is testing the hypothesis that if blood lipids are lowered, cardiovascular morbidity and mortality will be reduced.

In order to determine the relationships of diet and nutrition to dental caries, periodontal disease, and the growth, development, and well-being of both hard and soft tissues of the oral-facial complex, the National Caries Program is conducting research to identify and develop noncariogenic sweeteners for use as sugar substitutes in snack foods; to assess the effectiveness of dietary and waterborne fluoride, strontium, selenium, lithium, and other trace elements on dental caries; and to identify and characterize food items with low cariogenic potential through a screening program.

Studies on the effects of nutrients, particularly of vitamins and minerals on vision and on functions of the eye, aim to examine the role of vitamin A in the development and functioning of the retina and the cornea, as well as the effect of dietary components on cataract formation. Vitamin A and protein/calorie malnutrition are also being studied as causes of blindness in children.

Finally, it is important to note the activities of the Division of Research Services (DRS) at the NIH. The primary objective of the DRS laboratory animal nutrition research program is to improve the quality of laboratory animals being produced for research by improving their nutritional status. A series of feeding trials are designed to evaluate new diets and to determine the nutrient requirements of various strains or stocks of animals within a species. Data obtained from these studies are the basis for formulating diets having optimal nutrient concentrations for specific animals. During the past year, a complete marmoset diet, a laboratory rodent diet with a low potential for chemical contaminant concentrations, and improved diets for guinea pigs have been developed. These data are used to develop standard reference diets for use throughout NIH and the biomedical research community. Diets with either deficient or excess nutrient concentrations are evaluated to provide animal models with nutrition related diseases for study by NIH investigators. Studies are also conducted to develop satisfactory diets for the various animal species being introduced to biomedical research as new animal models.

The intramural nutrition research programs of NIH complement and augment the extramural programs, by concentrating on research particularly rele-

vant to the mission of the Institutes that utilizes the facilities and scientific expertise available on the NIH campus.

NUTRITION RESEARCH TRAINING

The NIH supports training in biomedical and behavioral nutrition research in both the extramural and the intramural programs. Table V summarizes the obligations, and the number of persons who received training in FY '79.

Table V
NIH TRAINING IN NUTRITION -- FY '79

Institute	MD Degree	PHD Degree	Other Degree*	Pre-Doc	Total Number of Persons trained	FY'79 Obligations (in thousands of dollars)
EXTRAMURAL:						
Institute-Training Grants						
NCI		4		4	8	$ 129
NEI		1		2	3	28
NHLBI	28	30		20	78	827
NIAMDD	12	5	3	34	54	772
NICHD	2	2			4	87
NIDR		10	2		12	256
NIEHS		6		12	18	166
NIGMS	14	2		68	84	290
Subtotal	56	60	5	140	261	$2,555
Individual-Fellowships						
NCI		3			3	$ 46
NEI		3			3	37
NHLBI	2	4			6	64
NIA		1			1	14
NIAMDD	3	10			13	173
NICHD	3	3		1	7	102
NIDR	1				1	15
NIGMS	2				2	15
Subtotal	11	24	0	1	36	$ 466
EXTRAMURAL TOTAL	67	84	5	141	297	$3,021
INTRAMURAL						
NHLBI	2	4			6	$ 81
NIAMDD	16	7	1		24	534
NICHD	11				11	399
INTRAMURAL TOTAL	29	11	1	0	41	$1,014
NIH TRAINING TOTAL	96	95	6	141	338	$4,035

* Other Degree includes MD/PHD, PHD/DDS, DDS, DVM, DSc, etc.

The number of trainees in human nutrition research supported by the NIH has increased by more than 50 percent between FY'78 and FY'79 as shown in Table VI.

Table VI
NIH SUPPORT OF NUTRITION RESEARCH TRAINING, FY 1977 - 1979
(in thousands of dollars)

	FY 1977		FY 1978		FY 1979	
	Number	Cost	Number	Cost	Number	Cost
Extramural Training	182	2,061	169	2,419	297	3,023
Intramural Training	23	642	31	668	41	1,014
Total	205	2,703	200	3,087	338	4,037

The research training activities in the extramural and the intramural programs are described below.

Extramural Training

Within the extramural program, two basic mechanisms are used for nutrition training support: institutional awards and individual awards.

The Institutional National Research Service Awards, commonly called "training grants," are designed to enable institutions to make training awards to individuals selected by them for predoctoral and postdoctoral research training in nutrition. In FY'79, this mechanism was used to train 261 persons in nutrition, for a total obligation of $2,556,000. A total of 9,204 full time equivalent research trainees were supported through training grants by NIH in FY'79 for a total obligation of $116,193,000. The number of trainees in nutrition supported by training grants is 2.9 percent of all the trainees supported by this mechanism by NIH. This support represents 2.2 percent of NIH obligations for FY'79 training grants.

The Postdoctoral Individual National Research Service Awards, called "fellowships," are awarded to provide postdoctoral research training to individuals to broaden their scientific background and extend their potential for research in nutrition. In FY'79, the NIH supported 36 fellowships in nutrition for a total obligation of $467,000 out of a total of 1,993 fellowships with a total obligation of $27,468,000. The number of fellowships in nutrition was 1.8 percent of the total number for NIH and incurred an obligation of 1.7 percent of the total NIH obligation for fellowships. Therefore, in the extramural nutrition training program for FY'79, including both training grants and fellow-

ships, a total of 297 persons were supported at a total obligation of $3,025,000. Thus, 2.7 percent of all NIH trainees were receiving training in nutrition in FY'79. This effort accounted for 2.1 percent of NIH training obligations.

Examples of areas in which the trainees carried out their work include the following:

Epidemiology of cancer

Nutritional control of fat oxidation in cancerous mice

Thirst and its contribution to edema in heart failure.

Lipid metabolism and atherosclerosis

Experimental and clinical nutrition

Obesity: dietary, hormonal, and genetic determinants

Control of lipogenesis and obesity

Effect of peptide hormones on food intake and body weight

Nutrition in growth and development

Influences on preadipocytes in culture

Ontogeny of ingestion: Early learning and sensory function

Vitamin D metabolism during pregnancy

Newborn intestinal development

Bilirubin glucuronyl transferase in intestinal mucosa

Vitamin B_6 and tryptophan metabolism in pregnancy

Evaluation of esophageal function as it relates to age

Nutrition in relation to problems of oral biology

Nutrition and oral health

Dietary zinc and oral epithelial changes

Environmental and food toxicology

Metabolic regulation and weight control

Research in burns and trauma

Nutrition and arteriosclerosis

Ascorbic acid nutriture and steroid metabolism

Role of insulin and diabetes mellitus in HDL metabolism

The copper deficient rat lung as a model for emphysema

Blood pressure, lipids, and the vegetarian diet

Nutrition in cardiovascular disease

Cardiac nutrition and pharmacology

Evaluation of glucose metabolism in aging humans

Mixed function oxidation in the etiology of cancer

Nutritional control of fat oxidation in cancerous mice

Carcinogenesis and drug development

The effect of methionine deficiency on carnitine metabolism

Pregastric satiety in experimental hyperphagia

Mitochondrial aspects of pyridoxine metabolism

Synthesis and metabolism of Vitamin D analogs

Growth hormone and somatomedin in models of malnutrition

Insulin receptors in patients

Role of the liver in protein metabolism

Intramural Training

Within the NIH intramural program, three Institutes, NIAMDD, NICHD, and NHLBI, supported training of 41 scientists at an obligation of $1,014,000 in FY'79.

The intramural trainees are working in the following areas:

Fatty acid and fat soluble vitamins in cystic fibrosis

Regulation of secretion from gastrointestinal tissue

Mineral metabolism

Insulin receptors in diverse tissues

Hormone-like effects of food constituents

Catabolism of protein sulfation of alcohol

The role of the liver in protein metabolism

Obesity

Glycogen storage disease

Biochemical genetics

Fetal alcohol syndrome

Diabetes

Growth retardation in children with cystinosis

MANPOWER DEVELOPMENT IN EXTRAMURAL NUTRITION RESEARCH

In addition to the training programs discussed above, manpower development in nutrition research is enhanced through Research Career Development Awards and through Special Research Awards. The total obligation for these award programs was $1,570,000 for FY'79.

Research Career Development Awards (RCDAs)

RCDAs are awarded to enhance the career development of outstanding scientists with clear research potential or demonstrated capacity for independent research who require additional training and experience in a productive scientific environment to prepare for careers in independent research. In FY'79, 30 RCDAs were awarded in nutrition for a total obligation of $1,063,000.

Several areas of research were under study by RCDA recipients. In nutrition and cancer, these included: the biosynthesis of mammalian glycoproteins; lipids and membrane structures of leukemia leukocytes; and thymidine transport in normal and leukemia lymphocytes. In the area of cardiovascular diseases, research included: water metabolism in heart failure; sodium intake and the effects of potassium on hypertension.

Metabolic studies included research on: new dietary treatments in diabetes and various types of obesity; genetic and acquired obesity; glycerol-3-phosphate dehydrogenase and egg yolk avidin; metabolic effects of diet and meal pattern; regulation of food intake and body fat; exercise and lipid metabolism; enzymatic control of vitamin D_3 endocrine complex; regulation of human gastric responses to meals and hypothalamic control of body weight and feeding; and protein nutrition in experimental uremia. Studies on human development included research on: perinatal glucose homeostasis; maternal-fetal exchange of nutrients; relationship of dietary factors to age at menarche; regulation of carbohydrate and lipid metabolism during perinatal development; biochemical mechanism respon-

sible for glycosuria and aminoaciduria; regulation of adipose tissue development; maturational and adaptive changes in intestinal carbohydrate absorption in the postnatal period by noninvasive techniques of breath analysis; and lean body mass in children with cystic fibrosis. Other research covered: nutrition and the oral mucous membranes and the biochemistry of oral tissues.

Other Award Programs (New Investigator Research Awards and Academic Investigator Awards)

In addition to the RCDAs discussed above, the NIH employs two additional mechanisms for manpower development in nutrition. Special Research Award Programs include the "Young, New and Special Investigator Awards" that are issued to support basic and clinical studies so that newly trained investigators can remain active during the developmental stage of their careers. The elements of all Young, New, and Special Investigator Awards will be combined in FY'80 under the single title of "New Investigator Research Award" (NIRA) The purpose of the NIRA will be to encourage new investigators (including those who have interrupted early promising research careers) in basic or clinical science disciplines to develop their research activities within the program interests at NIH. This special grant supported program will provide research grant funds to help bridge the transition from training status to that of established investigator. The NCC plans to develop a program announcement for a NIRA in nutrition for FY'81.

"Academic Investigator Awards" create and encourage a stimulating approach to disease curricula that will attract high-quality students, foster academic career development of promising young teacher-investigators, develop and implement excellent multidisciplinary curricula through an interchange of ideas, and enable the grantee institution to strengthen its existing teaching program.

In FY'79, 18 awards were made in these two categories for research manpower development in nutrition: 17 Young, New, and Special Investigator Awards for a total obligation of $471,000; 1 Academic Investigator Award of $36,000. The total obligation for these programs was $507,000.

The areas under study by the 18 recipients of these awards include the following: effects of retinoic acid on the immune system; behavioral cardiovascular compliance strategies; dietary restriction, longevity, and aging of the central nervous system; dietary fats and antioxidants in mammary carcinogenesis; neural control of renal tubular sodium reabsorption; polyunsaturated fatty acid metabolism of human cells; coronary risk, psychology of dietary adherence; behavioral aspects of salt intake and hypertension; maternal malnutrition; the biochemical role of zinc in teeth and bones; and membrane integrity and cyclopropenoid fatty acids.

II

SPECIAL INTEREST AREAS IN NUTRITION

Biomedical and behavioral nutrition is a complex science, which has many aspects. Poor nutrition contributes to diseases such as atherosclerosis, obesity, hypertension, dental caries, iron deficiency anemia, diabetes mellitus, osteoporosis, and some forms of cancer; it detracts from the health of pregnant women, particularly adolescents; and it leads to poor fetal development and low birth weight babies.

In FY'79 many of these aspects of biomedical and behavioral nutrition were considered by the NCC to be particularly important so as to to merit special attention. Fourteen special interest areas in nutrition were identified, and grants and contracts pertaining to each area were designated. This section of the report describes in detail the efforts undertaken by the NIH in the following special interest categories:

Nutrition and Prevention of Disease

Nutrition and Genetics

Behavioral Studies in Nutrition

International Research in Nutrition

Epidemiological Research in Nutrition

Nutrition and Obesity

Nutritional Status

Nutrition and Aging

Child and Infant Nutrition

Maternal Nutrition

Total Parenteral and Enteral Nutrition

Nutrition Education for the Public

Nutrition Education for Professionals

Nutrition Education Research

The NIH nutrition program is presented in terms of fourteen special interest areas because of the scientific and political interest that has surrounded nutrition research in the most recent past. Prevention in general was singled out by the Department as research initiative, thus, nutrition and prevention of disease has been an area of prime importance in the NIH nutrition program. The wide range of research in nutrition and genetics has received a considerable amount of attention and has made significant advances due to the advances in other scientific disciplines such as molecular biology. Behavioral studies in nutrition have unveiled many of the psychosocial motivations behind various eating patterns. International research in nutrition encompasses worldwide problems of malnutrition and development. Epidemiological studies dealing with diet and nutriton have unveiled the various relationships between diet and cancer, and diet and cardiovascular disease. Epidemiological research has uncovered many of the tools and methods needed to assess how food habits and socioeconomic factors influence food selection. Obesity has been a major public health problem in the United States and warrants particular research attention. Nutritional status assessment has been designated as a particular interest by Congress and therefore the Department as evident from the Congressional request for an Implementation Plan for a Nutritional Status Monitoring System. Nutritional requirements throughout the life cycle, particularly in mothers, infants, children, and the aged continue to be of importance. Total parenteral and enteral nutrition research addresses the special needs of the patient, especially the critically ill. Nutrition education encompasses education for the public, for professionals, and nutrition education research as intervention trials.

The following summary table presents for each special interest area: the number of grants or contracts in each area; the expenditure of the nutrition component of grants and contracts in that area; and the percentage of the total FY'79 nutrition obligation of $133,852,000. Each project, i.e. a grant or contract, could appear in more than one special interest area. For example, a study on nutrition and genetics that has as its main objective to prevent the onset of disease in a child would appear would be counted in the following categories; nutrition and genetics, nutrition and prevention, and child and infant nutrition. Therefore, the total expenditure for the special interest areas, as given in the last column of Table VII, will add up to more than 100 percent.

Table VII

SPECIAL INTEREST AREAS IN NUTRITION -- SUMMARY TABLE*

Special Interest Area In Nutrition	Number of Grants or Contr.	Cost (Dollars in thousands)	Percent** of Total Cost
Prevention of Disease	607	53,284	39.8
Genetics	76	9,222	6.9
Behavioral Studies	158	20,372	15.2
International Research	43	2,776	2.1
Epidemiological Research	156	18,154	13.6
Obesity	77	6,710	5.0
Nutritional Status	169	26,047	19.5
Aging	58	6,883	5.1
Child and Infant	162	19,602	14.6
Maternal	52	4,031	3.0
Total Parenteral and Enteral	43	5,503	4.1
Education for the Public	23	2,334	1.7
Education for Professionals	43	6,831	5.1
Education Research-- Intervention Trials	19	1,945	1.5

---

* A grant or contract may be assigned to several special interest areas.

** The total cost of the nutrition program in FY 1979 is $133,852,000.

Nutrition and Prevention of Disease

Approximately 36 percent of the nutrition research supported in FY'79 by the NIH was concerned with the prevention of disease or was directed toward obtaining information that would lead to preventive measures. The total obligation in this category was $53 million; support was provided by NCI, NEI, NHLBI, NIAID, NIAMDD, NICHD, NIDR, and NIEHS.

The working definitions used by the NCC for prevention are as follows:

> Primary prevention: Actions to promote health or undertaken prior to the development of disease.
>
> Secondary prevention: Detection of disease in its early (asymptomatic) stages and intervention to arrest its progress.
>
> Tertiary prevention: Intervention after the development of a clinically manifest disease in order to reverse or arrest its progression.

In studies involving the early stages of the life cycle, much of the research deals with dietary intervention in primary prevention as a means to prevent the development of secondary effects such as mental retardation; to compensate *in utero* for placental insufficiency; to determine the nutritional status of the pregnant woman; to supplement the diet of previously malnourished children; and to determine quantities of essential nutrients needed for optimal development of the normal person. Another group of studies deals with malnutrition and the immune system. Interests are focused on modulating effects of specific nutrients on immune function and resistance to infections; the effect of enteric infections on nutrient absorption and child growth; the modulating effect of trace nutrients on microbial virulence, as well as the mechanisms of food allergies and immune response to ingested antigens.

Also of interest is research that examines the effects of varying amounts of dietary substances on the function of various target organs and aging, and the effect on longevity. For example, in a longitudinal study of rats from weaning to senescence, three different dietary fats and two types of tocopherol are administered to determine the polyunsaturated/saturated fat ratios and vitamin E levels optimal for survival; this study will measure the effects of these substances on a number of structural and biochemical changes in brain, heart, and liver as well as on lifespan. A study of the interactions of ozone as an air pollutant, dietary vitamin E, and various unsaturated fats will focus its examination on the lung as a target organ. Another project will study the effect of tryptophan restriction on the aging of rats in relation to anterior pituitary function, neurotransmitter levels, and spontaneous tumor development. Changes in mitochondrial metabolism and the function of other intracellular organelles are also studied. Another project seeks to obtain information on the effects of prenatal malnutrition on aging and longevity with particular reference to the brain. Other studies concern riboflavin and vitamin A deficiency and their influence on protein and energy requirements.

Other research on nutrition and the prevention of disease includes studies on: the role of dietary fiber in digestion and absorption, and transit time in the gut as related to prevention of such diseases as diverticulosis, diverticulitis, gallstones, hemorrhoids, coronary heart disease, and cancer of the colon; function of trace elements and newly recognized dietary essential minerals; the bioavailability of nutrients and the factors that may influence nutritional requirements of individuals; and methodologies for measuring nutritional status with the establishment of nutritional guidelines.

The prevention of dental caries, peridontal disease and oral-facial abnormalities due to nutritional deficiencies, or excesses, is of considerable interest in nutrition research. Projects include determination of the systemic effects of deficiencies and excesses of protein, vitamins, and trace elements such as fluoride, in oral health and disease. The National Caries Program is conducting research to identify caries-preventive dietary food items.

The treatment of corneal disease with vitamin C is being investigated and clinical trials continue on the protection against induced retinopathies, particularly retrolental fibroplasia, with vitamin E. The role of Vitamin A in the formation and functioning of the retina and the cornea, and possible nutritional relationships to cataract formation is also under investigation.

Food toxicology comprises another major portion of research in nutrition and prevention. Exploration of the human health hazards of natural products and contaminants, toxic environmental agents intentionally or incidentally introduced into foodstuffs, and changes associated with food storage and processing, includes studies on the toxic risks and effects of ingested contaminants on the primary digestive system with emphasis on mechanisms of transport through the gut. The interactive relationships between exposure to environmental contaminants and nutritional factors (e.g., fasting, dehydration, dietary deficiencies, and supplements) are explored in terms of the affect on toxicity and possible pathogenesis.

The carcinogenic potential of certain food products and food processes are also under investigation. The influences of various methods of thermal processing, such as spray drying, drum drying, pasteurization and cooking by frying, broiling, and microwave, and conditions that contribute to the formation and occurrence of carcinogenic n-nitroso precursors in various foods including meat, cheese, and milk are being studied. Methods are being developed to detect, identify, and classify nitrosamines that may be found in the food supply. For substances already identified, research is underway to assess a chemical compound's relative hazard and to develop food processing procedures that will eliminate or minimize their effect.

Another large group of studies are underway to identify individuals at high risk for cancer long before clinical symptoms become manifest. Research is in progress to study the genetic predisposition of young women to nutrition related malfunctions of the immune system that permit the

process of carcinogenesis, particularly in the breast. Nutritional epidemiological studies offer the potential of identifying factors that promote or retard cancer, and of recommending specific dietary/lifestyle changes to the American public, particularly in regard to dietary intake of fats and fiber.

Studies being conducted in rats range from testing the theory that undernourishment increases life span, diminishes the incidence of cancer and also prevents aging of the immunological system, to research on specific dietary components such as the anticancer properties of vitamin A and its synthetic analogs, the influence of dietary selenium on pancreatic carcinogenesis, and the influence of dietary fat types, individual fatty acids and dietary-fat/selenium interaction on the development of spontaneous mammary tumors.

A large number of grants and contracts are related to the prevention of cardiovascular disease. Many of the clinical trials, such as the Multiple Risk Factor Intervention Trial (MRFIT), Lipid Research Clinics, Hypertension Detection and Follow-up Program, Hypertension Control in the Work Setting, Statewide Coordination of High Blood Pressure Control are studying the use of counseling and other techniques to change diet, and the use of diet in the prevention of heart disease. The role of lipids in arteriosclerosis, the role of sodium and body weight in hypertension, the role of high density lipoprotein (HDL) in prevention of cardiovascular disease, and other dietary changes to reduce its risk are a major concern in prevention programs.

Nutrition and Genetics

Biochemical genetics has advanced our understanding of the interactions between heredity and nutrition, of the development and treatment of certain diseases, and of normal development and disease prevention. In the genetics and nutrition program at the NIH, research on the effects of nutrition and dietary intervention on inherited diseases and conditions is supported by the NCI, NHLBI, NIAMDD, NICHD, NIEHS, NIGMS, and NINCDS. The obligation in this special-interest category was $9.2 million or 6.9 percent of the total cost of the nutrition program in FY'79.

Genetics and nutrition research is concerned with such areas as: inborn errors of metabolism including vitamin dependencies; determinations of cellular function, expecially DNA repair mechanisms; chromosomal aberrations; protein synthesis; metabolic disorders; obesity; and the role of dietary control in inherited diseases, including hyperlipoproteinemia, diabetes, and sickle cell anemia.

A number of projects are concerned with further elucidation of those inborn errors of metabolism (galactosemia, phenylketonuria, maple syrup urine disease and other genetic diseases) that are thought to be amenable, theoretically at least, to treatment by dietary intervention. For example, one study is characterizing, through biochemical, immunological, and genetic approaches, the inherited variation in activity of galactokinase and galactose-1-phosphate uridyltransferase. In other work, the emphasis is on the interaction between trace elements and genetics in

the mammal. Studies are also underway on the metabolic effect of nutrients on hereditary metabolic disorders that cause neurological abnormalities.

Differences in individual requirements for dietary-essential nutrients may be due in part to genetic variations that affect metabolic pathways and thereby the ability to utilize ingested nutrients. Thus, several research projects are aimed at achieving a better understanding of the metabolic role of diet in the causation, prevention, and treatment of genetic diseases and conditions. Carbohydrate metabolism, amino acid transport, the urea cycle, iron metabolism and iron-storage, and zinc metabolism are being studied in light of genetic effects. Studies on the nutritional aspects of genetic diseases and some conditions include: trace mineral metabolism and chondrodysplasia; iron-hooding in sickle cell disease; iron-storage disease in Cooley's anemia (Thalassemia major); the causes of arthritis; and familial zinc binding abnormality. Included also are studies on hereditary diabetes in the mouse; growth of preadipocytes in the genetically obese rat; and the molecular nature of rdrd mutation in chickens.

Research on the implications of genetics and nutrition to the aging process is another important area. Thus, research is being conducted to analyze nutritional and genetic factors regulating the lifespan and patterns of aging of Caenorhabditis elegans. Behavioral, physiological, and molecular parameters will be tested with nematodes grown on diets yielding very different lifespans.

In the area of environmental health, research consists primarily of investigations into the mutagenicity or mutagenic mechanisms of food-borne environmental contaminants and natural products. Mutagenesis-carcinogenesis associations comprise a significant part of this effort.

Other studies on genetics, nutrition, and carcinogenesis include: studies on differentiation and neoplasia carried out in an effort to characterize the transformation protein encoded with the sarc region of the Rous genome and to understand chromosomal packaging in human leukemia cells; studies on both the metabolic and genetic control mechanisms of amino acid synthesis in human and animal tumor; studies on the isolation and analysis of DNA mutation of cancer cells; studies to find methods of overcoming the rejection of transplanted organs; in vitro somatic cell genetic analysis of human cells; and the modulation of DNA mutation frequencies and DNA repair frequencies by environmental factors, including nutrients. In an attempt to identify individuals at risk before clinical symptoms become manifest, investigations on the possibility of detecting genetically susceptible women at high risk of breast cancer are underway. Such studies may determine if more than one genetically influenced form of breast cancer exists, and thereby elucidate the pattern of transmission in families. A further objective is to identify the protein product of the susceptible gene(s) by monitoring as-yet-unaffected individuals.

Studies are measuring the familial aggregation of plasma lipids and lipoproteins in order to clarify the mode of inheritance of serum lipid patterns. One project is studying the role of variation in lipoprotein phenotypes in determining certain forms of atherosclerotic disease. A

specialized center in arteriosclerosis is doing new research on genetic and non-genetic factors affecting the structure and composition of apolipoproteins and research on familial hyperbetalipoproteinemia. Other studies are investigating sodium intake and familial aggregation of blood pressure. The relationship of dietary sodium and potassium with urinary prostaglandin excretion is being studied in persons with a family history of hypertension. The role of dietary habits and parent-child associations in blood pressure are being studied in Seventh Day Adventists.

Behavioral Studies in Nutrition

The nutritional status of an individual depends not only on the physiological regulation but also on the motivation controlling food intake and food selection. Regulation and motivation, in turn, are governed by a set of peripheral variables (taste, smell, gastric factors, and humoral and metabolic factors) that are integrated in the central nervous system where they may be greatly influenced by learning of habits, and social, cultural, and religious values. The very important role of learning and habit in food preferences and aversions is thus an essential aspect of this part of nutrition research. In FY'79, the NIH funding level for behavioral studies in nutrition was over $20.4 million, or 15.2 percent of total nutrition research and was supported by NCI, NHLBI, NIAMDD, NICHD, NIEHS, NIGMS, and NINCDS.

A substantial portion of NIH research in this category is concerned with the possible deleterious effects of the cycle of malnutrition and behavior, attempting to pinpoint the nutrient and environmental deficits, and to determine the extent to which findings in animal subjects are also relevant for human populations. One research project is investigating feeding behavior as a means of elucidating various psychological parameters in development.

Food choices can be quantified and therefore can serve as definitive outcome measures in the study of developmental processes during infancy, childhood and adolescence. Of special interest are studies on the determinants of food selection and aversion, and studies on the determinants and controls of food intake at critical stages of the life cycle, i.e. pregnancy, infancy, childhood and adolescence.

Investigations on the neurochemical determinants of behaviors along with the historical, geographical, evolutionary, cultural and psychological factors that influence ingestive behavior are necessary. Currently, specific areas of research include the mother-infant dyad and suckling behavior, the development of taste responses, food preferences such as cravings during pregnancy or pica during childhood, and food aversion during adolescence.

Other research involves studies of the neuroendocrine influence on dietary preferences and feelings of satiation, and on feeding and drinking behavior generally. Food selection and regulation is effected by the peptides cholecystokinin, nerve growth factor, and the opioid polypeptide, but their exact role needs elaboration. Studies on internal sensing systems

and drinking behavior; adaptation and sensory coding in taste; neural systems of ingestive behavior; and psychobiology of stress-induced behavioral deficits are underway. The effect of amounts and balance of ingested amino acids on concentrations of neurotransmitters is also being studied, as the levels of brain serotonin, dopamine, and acetylcholine may influence feeding behavior. These studies emphasize effects on behavior of the adrenergic systems.

A large group of studies is concerned primarily with factors that influence feeding behavior as it relates to the problem of obesity. For example, a major study of the factors involved in the eating behavior of obese and lean individuals has developed a system for the comprehensive study of individual cases, with the intent of developing ways of modifying eating behavior and safely reducing the body weight of obese patients. Research is conducted to predict outcome in behavioral obesity treatment. They are also testing the effectiveness of modified "energy-diluted" foods as a means of reducing total energy intakes. Other studies include: body nutrient reserves and feeding behavior; and energy metabolism, hunger, and feeding.

Neurobehavioral studies are conducted to determine the neurotoxic effects of exposure to food-borne environmental contaminants, and to explore the potential of subtle neurobehavioral change as an early indicator of health impairment. Also underway is an analysis of mechanisms and the formulation of principles dealing with climatic adjustment of animals exposed and adapted to extreme climates such as those that prevail in the northern environment of the United States and elsewhere.

Considerable research centers around the application of behavior modification techniques in the treatment of patients with cancer or cardiovascular disease. Behavior modification intervention in the treatment of anorexia, and the evaluation of learned food aversion in the cancer patient includes hypnosis, biofeedback, and classical conditioning techniques. This kind of intervention is utilized to increase caloric and nutrient intake in both pediatric and adult cancer patients. Other approaches include development and distribution of information to help patients cope with cancer-related problems and tumor induced changes in eating habits.

Cancer patients treated with therapeutic regimens that induce gastrointestinal toxicity are being studied to determine whether they acquire learned taste aversions. The development of such aversions is followed with evaluation of its contribution to anorexia. Studies in neurophysiology indicate that a neurotransmitter, serotonin, may be manipulated to rectify tumor-induced loss of appetite. Thus, altering the adverse behavior attributed to changes in the appetite center in the brain is a major focus.

Mass media and behavior modification are used to inform individuals at high risk of cardiovascular diseases, as well as the general public, of the dietary factors involved in cardiovascular diseases. Target groups receive information regarding the means by which individuals can maintain

dietary control of physiological risk factors and thereby possibly delay or obviate such diseases. Some research projects are concerned with weight reduction and sodium restriction in the management of borderline hypertension. Evaluations are being made of the effectiveness of various behavioral intervention techniques. Three major projects in this category are the Multiple Risk Factor Intervention Trial, the Hypertension Detection and Follow-up Program, and the Lipid Research Clinics.

International Research in Nutrition

The NIH supports research in other countries as part of the collaborative studies program in nutrition as it relates to health maintenance, human development throughout the life cycle, disease prevention, and disease treatment. The NCI, NHLBI, NIAID, NIAMDD, NICHD, and NIEHS participated in international activities in nutrition. In FY '79, the total obligation in this category was $2.8 million or 2.1 percent of total nutrition research. The NIH supports special projects in nutrition to be carried out in other countries, provided such research is approved on scientific merit. Funds are made available to foreign investigators and to U.S. investigators for studies that involve populations in other countries.

In Finland, the biochemical mechanisms and adaptations in the metabolism of environmental agents in the gastrointestinal tract and lung are being studied. In Bangladesh, Panama, and Peru, Vitamin A, iron, and protein-calorie malnutrition and the effect of these nutrients on enteric infections and immune function are studied at the International Centers for Medical Research.

In Guatemala, the effect of protein-caloric malnutrition on mental development, and on serum factors responsible for opsonization of bacteria are being studied in infants and children. Data from a thirteen year longitudinal study testing the hypothesis that mild to moderate protein-caloric malnutrition adversely affects mental development has been computerized and the tapes have been deposited in the National Archives. These data tapes are currently available for further investigation in this area. Another study in Guatemalan children is looking at the effect of oral iron administration on attention span, learning, and memory, while at the same time collecting epidemiological data on zinc nutrition, lead poisoning and mortality rates.

Other NIH supported research, performed primarily in Central and South America, deals with the effects of malnutrition on various aspects of development, involving the mother, the fetus, and the infant. Studies consider the effect of breast feeding on the infant's immunity to enteric infection. Additional research studies are examining oral administration of Vitamin A in adults and the effect of different enteric microbial pathogens on its absorption; and the therapeutic efficacy of oral rehydration fluids on adults with cholera and infants and children with severe infantile diarrhea and dehydration.

Through the Malnutrition Panel of the U.S.-Japan Cooperative Medical Science Program, the NIH provides funds for basic and clinical research related to nutritional problems of importance to the health of Asian

people. Studies include research in the following areas: 1) environmental and host factors affecting nutritional requirements; 2) iron deficiency; 3) nutrition and infection; 4) effects of nutrition on physical and mental development, behavior, physical capability, and work performance; and 5) health consequences of different and changing dietary patterns and food habits. Studies are also sought on the effect of cultural and social influences of motivation and stress on the population's dietary habits; and on the cultural and behavioral determinants of individual nutrient intake, hunger, and satiety.

In Asian populations other research topics under investigation are: Prevention of gall bladder disease in Thai children; the comparative bioavailability of iron to infants from mothers milk vs. cows milk; inborn errors of carbohydrate metabolism; the function of carotenoids and vitamin A; the metabolic function of carnitine in children fed low-lysine diets; the incidence of diabetes among immigrants; human zinc deficiency; and goiter from iodine deficiency.

International research in nutrition allows for comparative studies that evaluate genetic, behavioral, cultural and geographic factors that determine nutritional status. In Canada, investigators are studying the prevalence of lactase deficiency among the Inuit Eskimos and Indians in relation to the effectiveness of Canada's milk fortification program. In Kenya, one study is determining dietary patterns, time and task associations, household income and expenses, and land and water resources available to randomly selected households in order to test the hypothesis that nutritional status is positively correlated with family land holdings and water supply and that both cash cropping and wage labor migration contribute to its deterioration. In Mexico, a study comparing the composition of breast milk of mothers from Mexico City to mothers from Houston, Texas, considers differences in ethnic background and diet, and exposure to agricultural and industrial toxins and pathogens.

Several international studies are epidemiological investigations of selected population groups to elucidate the possible role of diet and/or nutritional status on the incidence, pathogenesis, and natural histories of cancer. In order to identify patterns of cancer incidence in various ethnic populations, epidemiological studies carried out in Hawaii are based on the racial, ethnic, and dietary heterogeneity of the population where ethnic groups include Japanese, Caucasian, Filipino, Chinese, and Hawaiian. Japanese migrants to Hawaii are being studied for site-specific cancers of the stomach, large bowel and prostate. The goal of one study that adjusts for exposure to lung carcinogens and cigarette smoke is to determine the relationship between lung cancer and Vitamin A. Another Hawaiian study compares the association of urinary tract cancer with chemical mutagens in the urine of Caucasians with resident Japanese. This study will include an analysis of Japanese living in Nagoya, Japan. The relationship between cancer of the lower urinary tract and coffee, analgesics, artificial sweeteners, other beverages, and certain occupational exposures is also being studied in populations of Nagoya, Japan; Boston, Massachusetts; and Manchester, England.

Another epidemiological study compares the European subpopulations at high risk of developing breast cancer and the Asian and African subpopulations at low risk. This study is being carried out at the Chaim Sheba Medical Center in Israel.

In the U.S.A., Canada, Israel, and the U.S.S.R., Lipid Research Clinics have been established to conduct epidemiological studies on the prevalence of lipid disorders, the effects of diet on these disorders, and their relationship to cardiovascular disease. The studies are designed to generate internationally comparable information on plasma lipids and lipoproteins, cardiovascular risk factors, and demographic and nutritional data that will allow a comparison of the nature of the atherosclerosis problem.

As part of a cooperative research program with Japan on nutrition, hypertension, and stroke, epidemiological studies have been designed to investigate the diet, life style, and personal habits of Japanese men living in Japan, Honolulu, and San Francisco. Geographical differences in coronary heart disease mortality and the prevalence of risk factors have been documented in genetically similar populations of Japanese men. Collaborative research with Italy is also underway to examine the role of nutrition in improving cardiovascular function and preventing and treating cardiovascular disease.

The NIH also provides funds to support international conferences and travel for scientists to such conferences.

Epidemiological Research in Nutrition

The NIH is the lead agency in epidemiological research in nutrition. The role of food habits and the socioeconomic factors that influence food selection in health and disease are important components in epidemiological research and various clinical trials using epidemiological tools are underway. In FY '79, the NIH provided $18.1 million to support epidemiological research in nutrition; this is equal to 13.6 percent of total nutrition research. Institutes with programs in this area include the NCI, NHLBI, NIAMDD, NICHD, NIEHS, and NINCDS. The scope of the NIH research effort in this area is described below.

The various NIH projects in epidemiology can be grouped in five basic categories: 1) evaluation of nutritional epidemiological procedures; 2) studies of early nutrition on physical and psychological development in defined populations; 3) nutrition related epidemiological studies on maturation and reproductive function; 4) nutrition surveys of target or special population groups; and 5) epidemiological correlation of food intake to disease states.

The evaluation of epidemiological procedures is an important aspect of several studies supported by the NIH. For example, to assure that nutrition components of clinical trials use methodologies that produce reliable and valid dietary intake data and to assure compatibility of data among the trials, an evaluation has been undertaken of the dietary

data collection system developed and shared by the Lipid Research Clinics and the Multiple Risk Factor Intervention Trial.

Epidemiological studies in nutrition are concerned with the effect of early nutrition on physical and psychological development, and with nutrition and maturation and reproductive functioning. Thus, research is being done in the following areas; the clinical correlates of vitamin D status in infants, early malnutrition and immunologic competence, the development of obesity in children, the effect of diet on the age at which children reach menarche, and maternal nutrition, birth interval, and lactation, i.e. milk production.

Nutrition surveys of target or special population groups are conducted in association with several projects. In order to determine the underlying reason for major differences in patterns of cancer incidence that characterize certain groups, epidemiological surveys are conducted to obtain information about dietary practices and cancer incidence in various populations that are at either very low or very high risk. One study is underway to identify risk factors among populations that have migrated. Other comparative nutrition epidemiological studies are being conducted among American whites, blacks, and Spanish speaking persons, Mormons, and Seventh Day Adventists. The studies in the Mormons and Seventh Day Adventists are attempts to explain the lower incidence rates for cancer of the colon and sex linked cancers when compared to the populations at large in the same geographic area. Such studies seem to indicate an association between colon cancer and dietary fat and fiber intake. Information obtained from surveys aids in the development of hypotheses that can be tested in laboratory and animal studies.

The NIH supports research on the epidemiological correlation of food intake to disease states. These studies seek to determine the relative hazards or benefits of certain long-term dietary intakes in the human situation. Such research involves a diversity of population and ethnic groups, both in this country and abroad. One example is an epidemiological followup of the pharmokinetic and toxicologic experience of an Iraqi population accidently exposed to methyl mercury through treated grain. Another is the study of stroke in a specific population where the factors (including nutrition) that influence survival after stroke and possibly contribute to the incidence of stroke are being investigated. Yet, other epidemiologic studies are concerned with the correlation of food intake to disease states or conditions such as diabetes, obesity, gallstones, and cancer of the colon, stomach, bladder, pancreas, breast, and liver.

The majority of the NIH-supported epidemiological research in nutrition is concerned with persons at high risk for coronary and vascular diseases. Six major projects are underway: the Multiple Risk Factor Intervention Trial, the Lipid Research Clinics, the Hypertension Detection and Followup Program, Hypertension Control in the Work Setting, Statewide Coordination of High Blood Pressure Control, and the Type II Coronary Intervention Study. Clinical trials with a nutrition component are involved in screening the population or a specific segment of the population for cardiovascular risk factors. Epidemiological studies are clarifying the role of major risk factors and investigating other traits as possible risk factors. Trends in rates of fatal and nonfatal cardiovascular disease are being examined in some projects.

Nutrition and Obesity

Nutrition research on the biomedical and behavioral aspects of obesity is an important area of consideration at the NIH. In FY'79, the NHLBI, NCI NIAMDD, NICHD, and NINCDS supported research in obesity for a total obligation of $6.7 million, or 5 percent of total nutrition research.

Obesity is a major public health problem in the United States, affecting both children and adults. According to national statistics, one out of three Americans are obese. Of all women between the ages of 37 and 70 approximately 30 to 40 percent are considered obese (at 20 percent over their desirable weights as suggested by life insurance statistics). Children today are, on the average, 50 percent heavier than they were a generation ago; 30 percent of men in this country are considered obese, with some subgroups reaching even higher percentages of obesity. Furthermore, obesity is either a risk factor in or is associated with a number of diseases, including diabetes, hypertension, coronary heart disease, osteoarthritis, complications of pregnancy, and some infections.

The research effort at NIH parallels the extent of the problem, with studies encompassing obesity throughout the life cycle, as well as its relationship to specific diseases and conditions. Some of this research involves basic studies at the cellular level; an example is the study on nutrition and adipocyte growth and development. A different approach is taken in other research, in which the effects of regulating the appetite of the newborn are examined. Attempts to understand the neuroanatomical organization of areas of the nervous system responsible for the control of food intake and body weight regulation have begun. A large consortuim project to describe the natural history of obesity in Americans and to ascertain the childhood antecedents to obesity is also underway.

Studies on the basic, clinical, and behavioral aspects of obesity include research on feeding behavior in humans and in animals, body weight management, weight loss, and the metabolic regulation of fat cell growth in size and number.

Of particular importance is the multidisciplinary research on obesity being conducted at the Obesity Center at St. Luke's Hospital in New York City. Research has focused on eating behavior in various types of obesity, a study of peripheral signals of hunger and satiety in man, and the assessment of the effectiveness of "protein sparing" low calorie diets for use in reduction of body fat. The Center has also initiated a weight control unit to serve as a model of a comprehensive program for the study and treatment of human obesity. Optimal regimens are being developed for patient care, and new approaches will be tested. This Center has developed a universal eating monitor, which is used to measure eating rate and patterns of various types of foods in lean and obese subjects. Investigators at the Center are exploring the reasons that obese patients actually consume less in comparison with lean subjects eating the same foods. They also are investigating obesity of different etiologies (genetics, overeating due to diet palatability, ovariectomy), which produce independent additive weight gains.

Other studies include studies on the central nervous system regulation of fuel mobilization and storage, regulation of fat cell size and fat metabolism, the effect of meal pattern and diet on energy metabolism, effect of exercise on lipid metabolism, factors affecting appetite and hunger, pancreatic function, thyroid function, diet selection, regulation of growth of adiposite tissue, human feeding behavior, behavioral techniques for weight loss, intestional and gastric bypass operations in obesity, behavioral and metabolic correlates of genetic obesity, obesity and diabetes in pregnancy, and causes of diabetes and obesity in Oklahoma Indians.

Other research, in weanling rats, includes the study of the effect of surgical removal of subcutaneous fat depots on lipogenesis. It appears that such surgery has led to precise restoration of adipose mass and adipocyte number within 7 months. It is hoped that this research will lead to a determination of the role of adipose tissue in fat storage regulation and food intake control. Several studies have focused on a thyroid-dependent enzyme not found in the genetically obese mouse as a means of evaluating the possible mechanisms involved in human obesity.

Research on the aged and the aging process includes studies on obesity. One study, for example, is identifying age-related changes in fatty acid content in several tissues and is determining the effect of age on the rate of lipogenesis. A second project will measure a variety of parameters of cholesterol metabolism in rats to identify strain differences and find their underlying physiological cause.

Obesity as a risk factor in coronary heart disease and hypertension is studied extensively in various NIH projects, including the Multiple Risk Factor Intervention Trial, the Lipid Research Clinics, the Hypertension Detection and Follow-up Program, and the Stanford Five City Multifactor Risk Reduction Study. Related research projects include studies on: the effects of metabolic surgery on the hyperlipidemias; antilipemic regimens in peripheral arteriosclerosis; and prevention of high blood pressure in children. Obesity as a risk factor in adult onset diabetes is under investigation. Intervention projects are underway to reduce and sustain reduction in overweight and obesity in hypertension-prone persons.

Other research on obesity includes studies on the effect of diet and obesity on hormone metabolism and subsequent tumor development and growth in both animals and humans. Because hormones have been implicated in the onset and growth of tumors, the rate of metabolism of steroid hormones specifically androgen, estrogen, and cortisol is being examined in obese women undergoing drastic weight reduction and dietary manipulation. Additional studies in animals are investigating the effects of high and low fat diets, reduced caloric intake, and hypothalamic-induced obesity on serum hormone levels, specifically prolactin and estrogen, and the development and growth of mammary tumors.

The effects of starvation on myocardial structure and function; life change events and overweight; anthropometric assessment for screening and surveillance of infantile obesity; maternal obesity and carbohydrate intolerance on fetal outcome; conservation of lean body mass during total

starvation of obese subjects; dietary, hormonal, and genetic determinants of obesity; hypothalamic control of body weight and feeding; insulin and central nervous system control of body weight and feeding; and weight-loss risk reduction through behavioral techniques are all parts of the puzzle being considered in research on nutrition and obesity.

Nutritional Status

In FY'79, research on nutritional status was supported by the NIH for a total of $26.0 million or 19.5 percent of total nutrition research. Individual Institutes with programs in this area include the NCI, NHLBI, NIA, NIAID, NIAMDD, and NICHD. The scope of the NIH research effort is described below.

Research on nutritional status supported by the NIH includes studies that relate to requirements for essential nutrients in terms of nutritional status throughout the entire life cycle, from fetal life to infancy, childhood, adulthood, and the aged. Such studies are carried out in normal subjects and in patients with various disease states. Specifically, NIH-supported research in nutritional status includes research into the methods that measure nutrient concentrations; biochemical, anthropometric, and maturational indices of nutritional status; dietary recall; and food composition studies. Within the Federal Government, the NIH is the major agency for support of nutritional status research and for the development of data that are used in nutritional surveys.

Studies on nutritional status include the following: epidemiological studies; psychometric studies measuring IQ, infant development, and behavioral changes; neurometric studies of visual or auditory stimulated responses in the brain as measured by electroencephalogram; metabolic balance studies such as endocrine calcium-sodium balance studies; isotope studies that track the metabolism of glucose, amino acids, and fatty acids through the body, particularly in patients receiving total parenteral nutrition. Enzymatic methods for determining adipose tissue markers and body fat content, radiolabeled antibody methods for measuring serum-ferritin in iron storage disease, radioimmunoassays for measuring vitamin A, methodology for rapid assessment of pantothenic acid status, new laboratory methods for discovering inborn errors of metabolism, and mathematical models for glucose production rates are also being examined.

A large amount of NIH-supported research is concerned with measurements of nutritional status in normal adults, as well as in infants and children. Studies on the requirements for essential nutrients include studies on trace mineral requirements for zinc, chromium, silicon, and fluorine. A number of projects deal with improving methods for determining vitamin status under varying conditions in infants, children, and pregnant women. Clinical measures to determine vitamin D status in infants, vitamin B_6 needs in pregnancy, and other vitamin needs in long term users of oral contraceptive agents are being examined. Studies involve assays for determining tissue storage of folate, pantothenic acid, and iron.

Methods of measuring body fat content in human subjects are being comparatively studied at the obesity centers, while other studies compare the hemoglobin levels in blacks and whites in order to determine true normal hemoglobin levels. Several other projects are related to methodologies for determining tissue components used in nutritional status measurements. Specific examples include metabolic studies on protein and specific amino acids, trace minerals like selenium and iron, and studies on certain vitamins. Human hair is being analyzed for use in fetal-maternal nutritional status assessment.

A special group of studies focuses on the nutritional status of pregnant women in order to prevent congenital abnormalities that may result from nutrient deficiencies of the mother during pregnancy, and to permit optimum physical and mental development of infants and children.

Because the elderly tend to have more diseases and illnesses, the NIH supports research specifically aimed toward assessing the nutritional status of the aged. For example, one study in this area aims to determine whether increases in adipose tissue and decreases in lean body mass are fundamental to the aging process and whether restricted feeding would slow or prevent such changes. The NIH is also funding a study to evaluate the effect of supplemental zinc on several parameters of health status and taste acuity in a group of normal, aging women.

Research in nutritional status also includes various animal models. One investigation is attempting to determine the levels of a number of trace elements in tissues of the rat throughout its entire lifespan. Zinc, copper, magnesium, calcium, selenium, manganese, and various enzymes related to these substances will be assayed in brain, liver, kidney, heart, and muscle. The changes in these parameters with aging will be studied and compared in both normally fed and underfed animals. In primates, various dietary patterns and their relationship to exploratory behaviors and habituation are also being studied. Another animal study is obtaining information on the effects on life-span of various aspects of meal-feeding, especially the timing of meal consumption in relation to daily light-dark cycles. The study will also provide data on how within-day timing of food intake influences metabolic patterns and thereby produces variation in circadian rhythms.

Since the ability to make meaningful interpretations of dietary data depends upon the accuracy of the available nutrient data, the NIH has entered into a collaborative program with the U.S. Department of Agriculture to underwrite the acquisition of certain nutrient data. The NIH supports basic food analyses for fatty acids and cholesterol that are performed by the Consumer and Food Economics Institute at USDA. As a consequence of these activities, the NIH, in cooperation with USDA and with food manufacturers, has developed an up-to-date comprehensive food table for calculating nutrient intakes. The NIH also supplied funds to the Nutrient Composition Laboratory at USDA to pursue development of automated analytic techniques for direct analyses of food and improved methods for collecting, recording, and evaluating dietary data. Current clinical trials and epidemiological studies have provided the opportunity to develop, test, and refine methods for measuring nutrient intake in

populations. The aim of this activity is to yield standardized measurement methods.

In addition to research in nutritional status of normal individuals throughout the life cycle as described in preceding paragraphs, the NIH supports considerable research concerned with the nutritional assessment of persons with various diseases and conditions.

One important area of concern to NIH is the nutritional assessment of patients with cancer. The overall research objectives are: 1) to evaluate the safety and acceptability of assessment techniques for normal controls and for patients with cancer; 2) to determine if the techniques are applicable in the field and in clinical settings; 3) to determine the mean values and ranges both for normals and for patients with cancer; 4) to follow prospectively possible changes in body composition in patients with cancer; and 5) to determine if optimal enteral or parenteral alimentation can maintain or reconstitute body composition of patients with cancer who are undergoing treatment. In order to achieve these objectives, studies include a wide spectrum of techniques with core data collected on anthropometric measurements, biochemical analyses, hematologic tests, urinalysis, skin fold tests, and diet diaries.

Methodologies to measure nutritional status of cancer patients include improving the tools to measure specific body pools and body tissue: studies include in vivo quantification of body nitrogen by whole body neutron activation as an estimate of total body protein, estimating total body water and extracellular fluid volume through the use of whole body impedance, determining body volume and surface area through biostereometrics - a technique that involves the translation of information provided by simultaneous photographs into a form that can be accepted and analyzed by computer; measuring adipose, musculoskeletal, cardiac and visceral tissue for assessment of protein calorie malnutrition, and determining body composition in patients with neoplasia by ultrasound techniques. Protocols are being developed for the use of ultrasonic measurements in clinical investigations. Immunological techniques are being evaluated for assessing the nutritional status of children with or without cancer both in the field and in clinical settings.

Additional NIH-supported research will develop new, more reliable, and more acceptable methods for the nutritional assessment of patients with cancer. The development, validation, and standardization of appropriate methods are essential if the effects of various nutritional support and treatment protocols on the nutritional status of patients are to be determined.

Another important area in nutritional status research is concerned with persons at high risk of coronary and vascular diseases and the role of diet in lipoprotein levels, specifically HDL. Several major projects underway include: The Stanford Five City Multifactor Risk Reduction Study, that involves five California communities with populations between 34,000 and 85,000, aims to bring about change in individual behavior and thereby decrease mortality and morbidity from coronary heart disease. Diet is an important component of this health education intervention program. Independent samples of approximately 1,000 participants are

assessed annually to determine changes in knowledge, behavior, and physiology.

The Research and Demonstration Center for Health and Vascular Disease conducts basic and clinical research and develops treatment protocols for heart and vascular disease through a focus of community efforts. A portion of the program of particular interest involves a comparative assessment of three meal plans designed to lower blood cholesterol: the Mayo Clinic diet, the Mayo diet plus nutrition counseling, and the Mayo diet plus counseling and behavior modification.

The Multiple Risk Factor Intervention Trial tests whether intervention in a group of 12,000 men 35 to 54 years old, who are at above-average risk of death from coronary disease, can yield a 50 percent reduction in mortality from coronary heart disease. The intervention component of this trial is designed to bring about changes in eating habits to achieve a reduction in serum cholesterol. Particularly important to this study is simultaneous evaluation of several risk factors. The nutrition methodology is standardized with that used in lipid research studies to facilitate comparison among different studies.

The Lipid Research Clinic program has two projects of importance to nutritional status research: the Prevalence Study and the Coronary Primary Prevention Trial. The Prevalence Study, involving 10 clinics, is an internationally based study of the prevalence of dyslipidemias in defined populations. This large-scale, multi-center collaborative population study uses comparable methodology to enhance detection of dietary influences on lipid transport diseases. The Coronary Primary Prevention Trial involves more than 3,800 men between 35 to 59 years of age and tests whether lowering cholesterol in hypercholesterolemic men will reduce or slow the development of premature coronary heart disease; the nutrition objectives are to achieve moderate long-term dietary intervention in patients taking cholesterol-lowering drugs, to assess the pre-study diet, and to evaluate group changes in dietary intake after counseling.

An additional project is the centralization and computerization of dietary recall data. This multifaceted program covers the role of salt, overweight, nutrient metabolism, and diet in general on high blood pressure prevention and management. Particular efforts are directed toward reducing overweight and intake of salty snack foods in hypertensive patients.

Another area of research on nutritional status is a large group of studies related to parenteral nutrition, with emphasis on the requirements for fatty acids, protein, amino acids, trace elements, and other micronutrients. These studies are intended to develop complete chemically defined mixtures for use in parenteral feeding. Metabolic studies of parenteral nutrition in infants are also underway.

Various other studies include a miscellany of research. For example, the use of red blood cell "ghosts" for delivery of iron chelators to sites of iron storage in order to diagnose and follow-up of patients with iron storage disease is being investigated. A study on patients with phenylketonuria seeks to assess learning ability and motor performance. The feasibility of using selected immunologic tests as a correlate of

malnutrition in patients with hypercatabolic illness is another study. Another area is concerned with research on nitrogen balance in surgical patients and on the role of host defense mechanisms in the control of surgical infection under various dietary intakes.

Nutrition and Aging

The Institutes supporting research in FY'79 on nutrition in aging are NIA, NEI, NIAMDD, NHLBI, and, NCI in the amount of $6.9 million or 5 percent of total nutrition research.

Biological aging in human beings advances continuously from the very first moment of conception. Heredity establishes the foundation for the body's ability to cope with the psychophysiological changes that occur with aging, but good nutrition may in fact make the foundation stronger and more resistant to such changes. A major question for scientists today is whether nutritional needs change significantly after the first fifty years of life; and if so, how do these needs change and what specific nutrients are involved? Both laboratory and clinical studies examined the effect of aging on the need for vitamins, fat metabolism and atherosclerosis, mineral metabolism and taste acuity, biochemical changes in the brain, and protein or amino acid metabolism and bone density.

As people age, the maintenance of health and prevention of disease is more of a problem. Cancer, atherosclerosis, coronary artery disease, hypertension, blindness, etc. more often affect the elderly than the young.

The incidence of tumors observed in old age is very high. The metabolic parameters studied in experimental animals that might contribute to this phenomenon include: body weight and body composition; efficiency of energy utilization; and maintenance requirements. Research is also underway to ascertain whether any biochemical change in the cellular metabolism of chemical carcinogens can be correlated with an increased vulnerability to cancer. The question as to whether or not age increases this vulnerability by preventing the conversion of carcinogens by the liver to their less carcinogenic metabolites is being studied.

It is thought that dietary restriction initiated in adulthood may inhibit spontaneous carcinogenesis by its effect on the immune system. Age sensitive immune indices such as lymphocyte proliferation, humoral immune response, and lymphocyte toxicity are being studied to determine the effect of diet on the aging immunologic suppressor response.

One of the major causes of blindness in the U.S. is senile macular degeneration, a degenerative change in the retinal pigment epithelium (RPE) that comes with age and the accumulation of lipofuscin. Studies include an evaluation of the effect of Vitamin E on RPE and the experimental modification of the lipofuscin content of RPE cells.

The Prevalence Study of the Lipid Research Clinics includes individuals 75 years and over who have gone through a series of two screening visits to determine their plasma levels of low density lipoprotein (LDL) choles-

terol and triglycerides. The study has shown that levels were lower in individuals over 70 years of age than in those between 60 and 70 years of age. The development of atherosclerosis and its relationship to lipid levels, and hypertension, etc. are common concerns in geriatric research along with sulfur/amino acid metabolism, bone density and the development of osteoporosis.

Many of the Clinical Nutrition Research Units contain a geriatrics program component which provides training for professional career students in the field of geriatrics, as well as nutritional support services for the geriatrics patient.

Child and Infant Nutrition

Research on the role of nutrition in maintaining the health of infants and children is a very important part of the nutrition program at NIH. In FY'79, $19.5 million or 14.6 percent of total nutritional research was spent by the following Institutes supporting research in this area; NICHD, NHLBI, NIAID, NIAMDD, NIDR, NIEHS, and NINCDS.

Every child born is a product of his or her genetic background that must bear the environmental influences of our time. Nutrition is one factor that plays a major role in the proper growth and development of infants and children. Women in the childbearing years are advised to maintain adequate body stores of vitamins and minerals so that their body is ready to handle the additional demand for nutrients that comes with pregnancy. And in recent years, attempts to determine specific demands and to uncover the possible role of nutrition before and immediately after birth have led to exploring the environment of the fetus and the neonate.

In order to understand growth and development throughout the life cycle, research studies are underway to more fully explain the interactive role of the various nutrients in relation to early stages of growth and development. Metabolic capacity and the development of fat absorption is being studied in the neonate, while the mechanisms of enzyme production and neural tissue development, and the correlates of adipose cell growth and the regulation of appetite are being studied in the infant.

Malnutrition, in terms of pre- and postnatal undernutrition, and its effect on mental development and behavior has been a research interest for a number of years. Undernutrition often occurs in various disease conditions or along with the inborn errors of metabolism such as phenylketonuria, galactosemia, and homocystinuria. Some of the specific areas of study in infants and children include energy relationships in inborn errors of metabolism, inherited abnormalities of iron, copper and hemoglobin metabolism, the use of safflower oil in the treatment of essential fatty acid deficiencies in children, and the use of keto acid and amino acid mixtures as effective treatment to children with certain inherited metabolic defects of the urea cycle.

The effects of malnutrition are often compounded when an infant or child is exposed to a microbial pathogen and develops diarrhea. Studies are underway to examine the effect of specific enteric microbial pathogens on intestinal function and absorption of nutrients, as well as to examine the immune response of newborns to ingested antigens. Deficiencies in protein and calories, Vitamin A, and iron are specifically related to a decline in the immune response in children. In an attempt to treat these nutrient deficiencies, various oral rehydration formulations have been compared and therapeutically tested.

Research to identify and isolate undefined components of colostrum and human milk, (which may include hormones, enzymes, growth factors, etc;) as well as possible contaminants is given high priority. The most important discovery has been the role of breast milk in developing immunity against specific antigens in the breast-fed infant. Breast milk has been found to contain the antibody, secretory IgA, which is particularly important in protecting the infant against the intestinal infection that often leads to severe undernutrition, as well as antibodies against food proteins. These antibodies reduce the risk of food allergies in infants who are prone to developing them.

Laboratory evidence indicates that the biochemical, nutritional, immunologic and anti-allergenic properties of breast milk contribute to improved nutrition, and health and survival of infants. As a result, information is being collected on methods of collecting, storing, processing, and distributing human milk and colostrum through a Human Milk Bank Research Distribution Center. Such a center may ameliorate many of the causes of morbidity and mortality in the normal infant, low birth weight infant, and premature infant.

Assessing the transmission of other environmental agents from mother to child is also an important priority with projects exploring the pharmacokinetics and toxicity of these agents in offspring exposed during the perinatal period.

Research projects are studying the possible nutrition-related risk factors in infants, children, and adolescents that may play a role in hypertension, arteriosclerosis, juvenile onset diabetes, cancer, and dental caries. The Specialized Center of Research (SCOR) in arteriosclerosis focuses on anthropometric parameters, blood pressure, serum lipids and lipoproteins, smoking, and blood glucose levels as possible risk factors for arteriosclerosis in children. Dental caries is a major public health problem in children; consequently factors that may affect abnormal tooth development and thereby increase caries susceptibility are being examined. The Diet, Nutrition, and Cancer Program includes pediatric cancer patients in an effort to provide and evaluate total parenteral nutrition as an adjunct to therapy.

Finally, the Clinical Nutrition Research Units include research directed toward the nutritional needs of infants and young children.

Maternal Nutrition

In FY'79, research on maternal nutrition as supported by NHLBI, NIAMDD, NICHD, NIDR, and NINCDS totaled $4 million, or 3.0 percent of total nutrition research at NIH. It is now an accepted tenet that the nutritional status of the mother affects not only the growth and development of the child, but her own health as well. Many of the nutritional questions, however, remain unanswered and the problems remain to be solved.

Studies with an emphasis on the relationship of nutrition to reproduction attempt to analyze the effects of vitamins on reproductive functioning and morphology, the consequences of malnutrition on reproduction and lactational amenorrhea, the relationship between oral contraceptive use and vitamin metabolism, the role of nutrition in population dynamics, and the establishment of maternal nutritional requirements during pregnancy and lactation that assure optimal growth and functional development of the fetus and newborn. The goal of a large research program in maternal-fetal nutrition is to achieve a better understanding of the complex relationship that exists between the mother and her fetus and the means by which nutrients pass from one to the other. This research focuses on efforts to predict the nutritional status of the fetus through the examination of various factors in the mother's blood; on the elucidation of the mechanisms of placental transfer by which glucose, amino acids, vitamins, zinc, calcium and other essential nutrients are transported in proper amounts from mother to fetus; and on the effects of excessive or deficient amounts of certain nutrients on the morphology and endocrine development of the fetus. In addition, emphasis is placed on fetal development in nutritionally or metabolically compromised pregnancies as well as on elucidating predictors of intrauterine growth retardation, assessment of the mental development of growth retarded infants and exploring the appropriate nutritional intervention to potentiate their mental and physical development.

Other conditions that often are associated with pregnancy or lead to complications in pregnancy include toxemia, hypertension, obesity, eclampsia, diabetes, and renal disease. Efforts are being made to learn how to manage the nutritional needs of a normal pregnancy as well as gestation complicated by hypertension and renal disease, obesity, diabetes, and deficiencies in nutrients such as folate or iron. Folate deficiency in pregnant women has been associated with spontaneous abortion, toxemia, premature deliveries, and fetal abnormalities.

Total Parenteral and Enteral Nutrition

The NIH supports and conducts research and training in various aspects of total parenteral nutrition (TPN). The NIAID, NCI, NIAMDD, NEI, NICHD, and NIGMS support research in this area. In addition to extramural support, the NCI also supports studies in TPN in its intramural program. Training in TPN is supported by NIAMDD and NIGMS. Total research obligations in the extramural program totalled $5.5 million for FY'79 or 4.1 percent of total nutrition research.

The extramural research support includes studies on the determination of nutritional requirements of patients that receive hyperalimentation, as well as studies on the methodology to define precisely the nutritional status of patients. Such studies are carried out in low-birth-weight infants, in children hospitalized because of trauma and burns, in patients with cancer and gastrointestinal disorders, or who have undergone surgery, and in the elderly. Because many patients receiving hyperalimentation seem to develop lesions consistent with Candida endophthalmitis without changes in the serology or positive blood cultures, studies are in progress to examine the serum for candida products, and the significance of these lesions in relation to infections other than Candida infections, hyperalimentation intravenous fluids or hypotension.

A study on new concepts in parenteral protein sparing therapy investigates: 1) the metabolism involved in the preservation of body cell mass using near isotonic infusions of amino acids; 2) the factors that influence the retention of these infused amino acids; 3) measurement of the dynamics of both whole body and visceral protein metabolism; and 4) the effect of amino acid therapy on survival. An additional study is on the effect of nutritional support on immune function and resistance to infection in patients with hypercatabolic illnesses.

A major thrust of the research is directed toward the elucidation of metabolic and pathophysiologic mechanisms associated with the hypermetabolic response to burn and traumatic injury; the development and application of quantitative methods for evaluating the effects of hyperalimentation in undernourished cancer patients; and the determination of the effects of hyperalimentation upon tumor response, duration of response, survival, tolerance to therapy, and weight change.

A major study on the effect of TPN as an adjunct to chemotherapy and prophylactic irradiation in patients with small-cell anaplastic carcinoma of the lung is underway. It seeks to determine the potential of TPN to improve clinical response to treatment, decrease treatment related toxicity, and improve patient survival.

Randomized clinical studies are designed to test the hypothesis that the administration of TPN is more effective than normal hospital regimens in maintaining adequate nutritional status and that it does not adversely affect tumor control. Other questions to be investigated include the effectiveness of TPN in maintaining the immune response and thereby lessening or moderating the complications associated with cancer radiotherapy, and whether TPN will actually result in a high success rate from total planned therapy. One cooperative clinical study is evaluating patients with a variety of cancer types of the abdomen and pelvis treated with high dosage radiotherapy. Another study compares regular oral diets with TPN by looking at the effects of TPN on the immunocompetence status in children receiving chemotherapy and pelvic irradiation.

In addition, the first prospective randomized trials of the use of TPN as an adjunct to radiation, surgery, and aggressive chemotherapy are in progress. The research includes prospective studies of the effect of TPN on the treatment of metastic sarcomas in adolescents, diffuse histiocytic lymphoma in adults, and patients with esophageal cancer. Another

study examines optimal nutritional support as an adjunct to cancer therapy in the adult. The study, which involves a number of institutions, is examining optimal nutritional support (specifically, TPN of adult cancer patients) to determine its effects on tumor growth, tolerance to antineoplastic therapy, and host-tumor response, and to evaluate its safety and efficacy in maintaining the nutritional status of cancer patients and improving the quality of life. All patients under study are on an active cancer therapy program, including surgery, radiotherapy, and chemotherapy.

Other research workers are investigating the optimal intravenous feeding of surgical patients by assessing the effects of specific intravenously administered fluid regimens using combinations of amino acids, glucose, and fat. The effects of different intravenous regimens on specific protein synthesis are being assessed by studying, in surgical patients, the rate of albumin synthesis by the liver by the highly specialized sodium ^{14}C carbonate technique. In addition, hormonal (insulin and glucagon) and intermediary metabolic (glucose, ketone bodies, free fatty acids, plasma and varying amino acid concentrations, apparent and standard nitrogen balances) factors are also being measured in order to assess the effects of the different intraveneous diets on interactions of hormones and intermediary metabolism interactions. Other studies seek to determine intravenous requirements for micronutrients (i.e., the levels of vitamins and trace minerals that must be present in TPN infusion fluids to maintain homeostasis in man). There is a focus on the effect of TPN on albumin synthesis, fat mobilization and protein sparing therapy in surgical patients, and on methods of early detection and treatment of essential fatty acid deficiency in patients receiving TPN. Three clinical nutrition research units include components with primary research emphasis on total parenteral and enteral nutrition support of patients.

Nutrition Education for the Public

Although the primary mission of the NIH is in biomedical and behavioral nutrition research and training, nutrition education for the public is an integral part of many programs. Total obligation for FY'79 was $2.3 million or 1.7 percent of total nutrition research. Two Institutes have specific mandates for information and education programs: the NCI and the NHLBI. Nutrition education for the public is also provided through programs funded by the DRR, NIAMDD, NICHD, NIDR, and the NCC Office. Efforts are continually made to translate the results of nutrition research into practical information for the American public. The aim of this nutrition education effort is to help the public select a healthy diet suitable to individual needs throughout the life cycle.

Information is disseminated through a variety of mechanisms. Publications dealing specifically with nutrition are available through the NIH. Public racks in almost 3,000 supermarkets, drug stores, and department stores are stocked with a selection of NIH publications. In addition, the "Search for Health" news column is sent to over 500 daily and small-town newspapers on a weekly basis. A collection of articles about NIH research developments is contained in the publication NIH News and

Features; from 8 to 10% of the content concerns nutrition. Public Service Announcements on both radio and television have been developed by NIH and are being distributed widely.

Another means of providing nutrition education to the public is through the NIH lecture series, "Medicine for the Layman," which is now in its third year. In FY'79, the series included a lecture on infant nutrition. The series is videotaped for possible use on public television.

A major contribution of NIH in nutrition education is carried out in clinical trials. Nutrition education and information programs are integrated into 13 clinical cancer education programs in response to the rising interest of the lay public in the role of diet and nutrition in cancer etiology and prevention, as well as in the treatment and rehabilitation of the cancer patient. In addition, the NIH supports education efforts of its regional cancer centers and provides technical support for the cancer telephone inquiry services of the American Cancer Society.

Education of the public is an important goal of the Diet, Nutrition and Cancer Program (DNCP). In FY'79, in an effort to analyze the need and possibilities for nutrition education, the DNCP collected information to serve as a basis for general dietary guidelines planned for release in 1980. In addition, the DNCP began the process of developing educational materials designed for primary, secondary, and college level curricula. The DNCP efforts to assist cancer patients through nutrition education included developing two handbooks for adult cancer patients on nutrition and cancer therapy: Health Through Nutrition, written by Ernest Rosenbaum and colleagues at the University of California, San Francisco; and Eating Hints: Recipes and Tips for Better Nutrition During Treatment, produced by the Yale Comprehensive Cancer Center. A third handbook, Diet and Nutrition: A Resource for Parents of Children with Cancer, developed by the NCI and the Candlelighters, is directed to the parents of children with cancer.

Additional education efforts are designed to translate the results of fundamental research in heart disease into practical suggestions for all Americans. The objective of one project is to judge whether the public will choose a healthy lifestyle from available alternatives. Good heart health through "prudent self-reliance" is especially important in nutrition, where choices of eating styles are both controversial and elective. Other recommendations offer practical behavioral advice on how to implement and sustain new health habits required for a more healthy life style.

In FY'78, with the cooperation of the Giant Food Corporation, a year-long program to provide heart health nutrition information and education in supermarkets was initiated in ninety supermarkets in Maryland, Virginia, and Washington, D.C. Through large in-store posters and free publications called "The Eater's Almanac," consumers were given information on the growing scientific evidence on the relationship between diet and coronary heart disease. The program goals were to inform consumers and encourage them to make personal risk assessments and to evaluate the impact of point-of-purchase information on the pattern of purchases.

The program is presently in the evaluation phase. The evaluation considers: 1) changes in reported knowledge of heart health and nutrition issues and in reported use of food preparation methods as they relate to heart health; and 2) changes in the purchase of foods designated as lower in saturated fats, cholesterol and calories, and among alternative foods which are higher in saturated fats, cholesterol and calories. Consumer food selections were monitored by the computer assisted checkout system. Approximately forty food categories, representative of foods related to heart health were observed. The Baltimore stores served as a comparison group for evaluating the program's effectiveness in Washington, D.C., Virginia and other Maryland stores.

Three other nutrition projects underway are the Vending Machine Nutrition Project, the Food for Thought Game, and the Research and Demonstration Center for Health and Vascular Diseases. In cooperation with the National Automated Merchandisers Association (NAMA) and the Macke Company, a pilot project was run in selected NIH vending machines in which a) low as well as high calorie snack food was offered for sale and b) calorie information was supplied in the same display windows that show samples and prices. Initial results of the project show that marketing nutritious snacks can be a profitable venture.

The Food for Thought game is a program designed for use in cafeteria settings: the "game" uses fifty two attractively designed playing cards with messages that emphasize a lower calorie, nutritionally well balanced meal. The "game" was played in selected NIH cafeterias in 1977-78 and was evaluated as effective in helping employees reduce their average calorie intake at lunch. In the spring and summer months employees increased their consumption of lower calorie foods. Food selection rates and calorie purchases were observed for ten weeks after the "game" ended and no recidivism was observed. This program has been distributed nationwide through the American Heart Association and the American Hospital Association.

The program of the Research and Demonstration Center for Health and Vascular Disease includes publications on heart health designed for the Spanish speaking populations in the greater Houston area and a cooperative program with Home Demonstration Clubs of the County Extension Service that attempts to change dietary habits especially in lower income blacks.

In both heart disease and cancer, targeted populations are being exposed to nutrition education for the maintenance of health or treatment of disease. These NIH nutrition education programs appear to be successful and indicate that people, given sound applicable information are in fact willing to change and improve their dietary habits.

Publication and dissemination of nutrition information is common practice for many Institutes at NIH. In FY'79, the NIH initiated the development of two public education pamphlets, one on obesity and one on general nutrition. The program attempts to answer the public demand for nutrition information by providing reprints, fact sheets, and publications on nutrition topics such as obesity and energy metabolism. In the print media, nutrition research information has been provided to a number of

staff or free lance writers of popular magazines such as Good Housekeeping, Family Health, and Cosmopolitan.

A large campaign is devoted to informing and educating the public on ways of preventing tooth decay and other oral health problems. Two publications devoted to healthy teeth through the development of good eating habits and preventive practices, such as the use of fluoride and good oral hygiene, were prepared and distributed. One publication, entitled "Supersnacks", emphasizes the role of sugary snacks in the development of tooth decay, the leading chronic disease affecting children. The other publication, "Good Teeth for You and Your Baby", was prepared for expectant mothers and for mothers of young children. It emphasizes the "how to's" of good dental health habits for both mother and child. Neighborhood health clinics, supermarkets, childbirth and baby care classes, magazine advertisements, state and local health departments, and many other outlets have been used to distribute this publication, which was prepared in Spanish as well as English. Over half a million copies were distributed in the first six months following publication.

In conjunction with these publications, two Public Service Announcements entitled "Magical Munching" and "Notes on Good Snacking" were developed. The intended audience for the first television spot consists of children aged 6 to 12 years while the second is aimed at teenagers. Radio spots, posters, and other materials for children, as well as assorted materials for educators were also developed to enhance the effectiveness of these spots.

Publications aimed at particular audiences are produced by a number of Institutes. They range from nutrition publications that address the dietary needs of pregnant women and infants to publications that attempt to explain special dietary regimens for those persons with specific health problems. A pamphlet on food allergy was prepared explaining the allergenic reactions of those persons sensitive to certain foods.

The DRR supports two projects that are concerned with nutrition education for the public. The first is a computer based nutrition counseling program, and the other is studying two methods of dietary education for weight reduction of persons with maturity onset diabetes.

Another service provided by all the Institutes and by the NCC is the handling of public inquiries, both by mail and telephone. Information specialists are available during working hours to answer any questions--lay or professional--not only on nutrition, but also on all research topics within the purview of the NIH. In addition, the NCC maintains a full-time office staff to provide support to the Committee and to serve as a focal point for nutrition information. The NCC Office responds to inquiries from the scientific community, the media, and the concerned public.

The NCC office also participated in an NIH staff training seminar on the politics of nutrition and in the NIH sponsored Science Writers' Seminar. The entire NCC participated in "Health Works '79", a health fair sponsored by the Department of Health, Education and Welfare. The four themes of the fair included; Nutrition, Physical Fitness, Stress Management, and

Living Habits and Safety. NIH was responsible for several activities in the Nutrition Tent. Many of the materials provided in the Tent have been incorporated into a package of materials for use by the local talent and faculties across the country.

Nutrition Education for Professionals

Studies and programs involving nutrition education for professionals accounted for about 5.1 percent or $6.8 million of the NIH nutrition program for FY'79. Nutrition education for professionals is provided by the NIH through various means. The latest developments in nutrition research are published in such medical and scientific journals as the Journal of the American Medical Association, The American Journal of Clinical Nutrition, The Journal of Pediatrics, The Journal of the National Cancer Institute, The Journal of Clinical Investigation, The New England Journal of Medicine, and many other journals.

The following general purpose scientific references on nutrition, infection, and immunity are used to educate the professional: "Malnutrition and the Immune Response", Robert M. Suskin (Editor), Proc. Foundation Series, Volume 7, Raven Press, New York, 1977, Nutrition, Immunity and Infection, R. K. Chandra and P. M. Newberne, Plenum Press, New York, 1977; "Symposium on Impact of Infections on Nutritional Status of the Host", W. R. Beisel (Editor), American Journal of Clinical Nutrition, volume 30, pages 1203-1566, 1977, Hunger Disease, Studies by the Jewish Physicians of the Warsaw Ghetto, M. Winick (Editor), John Wiley and Sons, New York, 1979.

The nutrition publications of the NIH for professionals include: The Dietary Management of Hyperlipoproteinemia - A Handbook for Physicians and Dietitians, (NIH publication No. 80-110). This ninety-five page publication on the proper control of diet and body weight to manage primary hyperlipoproteinemia is available to physicians, dietitians, and nurses upon a written request. A ten page supplement to the handbook, entitled Fact Sheet: Hyperlipoproteinemia (NIH publication No. 79734), describes cholesterol and triglyceride, defines hyperlipoproteinemia and the different types, tells how the condition is diagnosed and describes current methods of treatment. A listing of diet publications and addresses where they may be obtained is available in References Relating to Diet and Heart Disease. A Statement on the Role of Dietary Management in Hypertension Control has been approved by the National High Blood Pressure Education Program Coordinating Committee; and "The Cholesterol Content of Foods," published in the Journal of the American Dietetic Association.

An extensive effort in professional education includes continuing education courses that are provided for paramedical personnel, medical students, nurses, residents, practicing physicians and research scientists. Courses range from basic principles of cancer biology to current methods of prevention, detection, diagnosis, treatment and rehabilitation.

As part of the Multiple Risk Factor Intervention Trial, a new Grocery Guide and participant's guide have been prepared to aid nutrition counselors in their education of participants. The latter includes explanations of the basic food pattern and changes to the Progressive Eating Pattern (PEP), eating away from home, PEP Exchange System, and Cook's Helper. Education programs for interventionists are being implemented and a PEP Manual for use by nutritionists has been prepared.

The NIH also supported the revision of The Recommended Dietary Allowances and the report "Research Needs for Establishing Dietary Guidlines for the U.S. Population", prepared by the National Research Council of the National Academy of Science.

NIH sponsored workshops and conferences are an important mechanism for imparting nutrition education for professionals. In FY'79, the NCC, the NCI, NHLBI, NIAMDD, NICHD, NIA, and NIGMS sponsored such activities. In addition, Institutes provide funds to national and international professional organizations for their annual meetings.

a) Nutrition Coordinating Committee

The NCC sponsored a workshop entitled "Nutritional support of the Patient: Research Directions for the 1980's." This workshop is described under Conferences Sponsored by the NCC on page 75 of the report.

b) The National Cancer Institute

In order to provide the best educational opportunities to health professionals, deficiencies in the present education system must first be identified. The NCI sponsored a workshop, entitled "Physician Education in Cancer Nutrition," on June 4-5, 1979 to examine the scope and content of physician education in nutrition as it relates to all aspects of cancer. It brought together people knowledgeable in the various aspects of nutrition that pertain to the management, causation, and all other nutritional aspects of cancer. Based on the recommendations of this workshop, the NCI began to expand the clinical education grant program to include a separate nutrition component. Researchers and clinicians alike must be aware of the dietary and nutritional considerations influencing cancer prevention and treatment, as well as factors that can affect basic research investigations.

c) National Heart, Lung, and Blood Institute

Through the presentation of short regional workshops cooperatively sponsored by NHLBI and the private sector (i.e. national and local branches of the American Heart Association), local practicing nutritionists, dieticians, physicians, or other professional health counselors are advised on methods for improving nutrition counseling skills. The role of the NHLBI is to stimulate local nutrition educators and to enumerate and evaluate present (and future) nutrition counseling resources in conjunction with the workshops; to stimulate interest of local nutrition

counselors by pre and post-workshop evaluation questionnaires; to provide expertise and assistance with workshop content and format; and to provide written and audiovisual materials for use within the conference format and also for distribution to other interested professionals (through other Institute channels). These workshops are referred to as Pilot Regional Training Workshops for Nutrition Counseling in Hyperlipidemia for Dietitians and Nutritionists, and are expected to be expanded in the future.

d) National Institute of Arthritis, Metabolism, and Digestive Diseases

During FY'79, the NIAMDD partially supported or jointly planned a number of conferences and workshops designed to provide information for health care research professionals. An international conference on "Effects of Alterations of Dietary Patterns and Food Habits on Health with Special Reference to Critical Analysis of Comparative Epidemiological Studies of Different Populations" was held on December 5-6, 1978 in Osaka, Japan. The conference was sponsored by the U.S. and Japan Malnutrition Panels, of the U.S.-Japan Cooperative Medical Science Program. The conference included a total of 27 presentations on the effects of alterations of dietary patterns and food habits on health with special reference to critical analysis of comparative epidemiological studies of different populations. The discussions at the workshop concentrated mainly on the relationships between nutrition and food habits and cardiovascular diseases in Japan and the U.S. It indicated the necessity of introduction of newer methods that make use of social science techniques in order to better understand individual behavior that may play an important role in food choices and health.

The following four workshops were sponsored by NIAMDD: The consensus workshop on "Surgical Treatment of Morbid Obesity" held December 4-5, 1978 in Bethesda, Maryland; the workshop on "Methodologies for Human Population Studies in Nutrition Related to Health," held July 24-25, 1979 in Bethesda, Maryland; "The Fourth Workshop on Vitamin D," held February 18-22, 1979 in Berlin, West Germany; and "The Fourth International Workshop on Phosphate" held June 22-24, 1979 in Strasbourg, France.

The consensus workshop on "Surgical Treatment of Morbid Obesity" was held on December 4-5, 1978. About 200 surgeons, internists, basic scientists, psychiatrists, psychologists, legal experts, patients, and representatives from health insurance companies convened under the sponsorship of NIAMDD in Bethesda, Maryland, to discuss the current status of surgical treatments for very severe or "morbid" obesity. This meeting was one of an ongoing series of consensus development conferences through which the NIH seek to establish agreement among knowledgeable experts in different relevant disciplines concerning the soundness, feasibility, selective applicability, and desirability of utilizing various newly developed and emerging medical technologies in clinical treatment and care.

Consensus was reached that surgical interventions should be limited to morbidly obese patients (defined as 100 pounds overweight) with serious physical health or psychosocial problems and who have tried, preferably on repeated occasions, suitable nonsurgical treatments, such as calorie

restriction and behavioral therapy, and who have failed to improve adequately, or who have always relapsed within a relatively short time after initial periods of successful weight loss.

The workshop on "Methodologies for Human Population Studies in Nutrition Related to Health" was sponsored by the U.S.-Japan Malnutrition Panels of the U.S.-Japan Cooperative Medical Science Program. The workshop's three major areas of emphasis included epidemiolgical methods, dietary recall methods, and significant health parameters. A separate session was held on the clinical, anthropometric, and biochemical methods. The participants recognized that long-term studies will be necessary to answer many of the questions raised, and a number of alternatives were suggested ranging from very expensive intervention studies to setting up "listening posts" for longitudinal surveillance. A major accomplishment of the workshop was that it provided a scientific/critical exchange by bringing together a wide variety of scientists who recognize the complexity of these studies and the need for careful planning, quality control, and special parameters to answer specific questions.

"The Fourth Workshop on Vitamin D" provided an opportunity for experts in the areas of chemistry, biochemistry, endocrinology physiology, and clinical aspects of vitamin D to exchange current research findings. 401 official delegates from thirty countries included representatives from Argentina, Australia, Austria, Belgium, Canada, Denmark, England, Finland, France, Germany, Holland, Hungary, Israel, Italy, Japan, Mexico, Netherlands, New Zealand, Norway, Poland, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, and the U.S.A. The ten invited speakers from the U.S. were sponsored by the NIH. Nine "younger scientists," defined as an individual under age 35 who has not yet or only recently received research support from NIH or NSF, also attended with NIH support, providing an opportunity for an infusion of "new blood" into the general area of vitamin D research.

"The Fourth International Workshop on Phosphate" was held in Strasbourg, France on June 22-24, 1979. There were 20 invited speakers, some 45 free communications, and 45 poster sessions on a wide range of basic and clinical topics related to the metabolism of phosphate, divalent cations, vitamin D metabolites, and aspects of urolithiasis. The workshop was well focused and productive as a mechanism for review of the state-of-the-art in these areas of research. Approximately 100 persons were in attendance.

e) National Institute of Child Health and Human Development and National Institute on Aging

On June 18-20, 1979, the NICHD and NIA cosponsored a workshop in "Nutrition, Behavior and the Life Cycle" to address the issues of food preferences and aversions, the developmental aspects of determinants of food intake, and the determinants of food intake particularly during pregnancy, infancy, childhood, and adolescence. Recommendations from the several task forces were aimed at answering the questions as to what kinds of foods are selected and why, what quantities are consumed, and how food habits change over the life cycle of individuals.

f) The National Institute of General Medical Sciences

A consensus development conference on "Supportive Therapy in Burn Care" was sponsored by the Committee on Medical Applications of Research, NIH, the National Institute of General Medical Sciences, and the John E. Fogarty International Center in cooperation with the American Burn Association. The workshop was held on November 10-11, 1978 to discuss supportive therapy in burn care. Five panels were assembled to answer specific questions on fluid resuscitation, infection, metabolism, smoke inhalation, and excisional therapy. Two specific questions relating to nutrition and answered by the metabolism panel were: What is currently known of the changes in metabolism imposed by severe burn injury? What are the currently available techniques used for maintenance of nitrogen balance of the severely burned patient - amino acid replacements, carbohydrate replacements, and combined amino acid and carbohydrate treatment.

Nutrition Education Research

In the area of nutrition education research, the NHLBI and NCI have special intervention projects to assess nutrition education programs. In FY'79, these two Institutes' total obligation was $1.9 million or 1.5 percent of total nutrition research. Intervention trials include the Stanford Five City Multi-Risk Factor Reduction Study, the Multiple Risk Factor Intervention Trial (MRFIT), the Coronary Primary Prevention Trial, and the National High Blood Pressure Education Program (NHBPEP).

In the Stanford Five City Multi-Risk Factor Reduction Study, dietary change is an important component of a "Media Intensive Health Education Intervention Program" designed to prevent coronary heart disease. The study, involving five California communities with populations between 34,000 and 85,000, aims to elicit individuals to change their behavior and thereby decrease mortality and morbidity from coronary heart disease. The intervention is directed to two of the communities by means of mass media and small group instruction to induce dietary reduction in the intakes of cholesterol, saturated fat, calories, and salt. The same means of intervention are used to induce cessation of smoking. The nutrition associated goals include lowering levels of plasma cholesterol, triglycerides, and lipoproteins; reducing high blood pressure; correcting obesity; and promoting physical activity. This study is based on a previous study of three California communities where persons exposed to mass media and face to face counseling showed a substantial and sustained decrease in the incidence of cardiovascular disease.

In the Multiple Risk Factor Intervention Trial (MRFIT), the intervention component is designed to bring about changes in eating habits to achieve a reduction in serum cholesterol in a group of 12,000 men aged 35 to 54 years old, who are above the average risk of death from coronary disease. The dietary intervention program utilizes techniques and knowledge of group dynamics and behavior modification. The nutrition methodology is standardized with that used in the lipid research studies in order to facilitate comparison of the results. Particularly important in this trial is measuring dietary adherence and simultaneously evaluating the

several risk factors associated with death from coronary disease. A reliable and valid method for measuring dietary adherence is presently being adapted for use with MRFIT's "Progressive Eating Pattern", (PEP), a modification of MRFIT's basic eating pattern. This method will eventually have widespread practical application outside this clinical trial.

Another clinical trial is the Coronary Primary Prevention Trial carried out by the Lipid Research Clinics (LRC) of NHLBI to test whether lowering cholesterol in hypercholesterolemic, but otherwise healthy men between the ages of 35 to 54 years, will reduce or slow down the development of premature coronary heart disease. The nutritional objectives of this trial are to achieve moderate, long-term dietary intervention in patients taking cholesterol lowering drugs and control groups, to assess the pre-study diet, and to evaluate group changes in dietary intake after counseling. An important component of this study is an Iowa based Food and Nutrition Resource Center that is responsible for producing periodical newsletters containing information on low calorie, low cholesterol and low saturated fat diets.

The National High Blood Pressure Education Program aims to develop means of providing better management of high blood pressure through a collaborative effort with the private sector, other Federal agencies, and state health departments through the education of health professionals, patients, and consumers. Because of the role that salt and weight play in the genesis, management, and treatment of many forms of hypertension, efforts are directed toward reducing overweight and intake of salty snack foods in patients with high blood pressure.

Research on ways to control hypertension also takes place at the work site; in one study individuals at risk for high blood pressure were identified by screening employees of Westinghouse plants in Maryland and the Washington area. These individuals were given an educational program that included the effect of diet in hypertension. In order to conduct basic and clinical research and development of treatment protocols for heart and vascular disease through community efforts, the NHLBI supports the Research and Demonstration Center for Health and Vascular Disease. Most of the nutritional components of the program are implemented through community outreach clinics by the Control and Demonstration Division. This division attempts to maintain cooperative efforts with local restaurants in order to advertise and include nutritious low cholesterol meals on their menus. With the Home Demonstration Clubs of the County Extension Service attempts are being made to alter dietary habits particularly in the lower socioeconomic class blacks. The division also designed the Spanish version of the Heart-Health publications, such as the Help Your Heart Eating Plan, for the Spanish speaking population in the greater Houston area.

The clinical research conducted as part of the center's diet clinic modification program has tested the ability of the following three meal plans to lower blood cholesterol: a) The Mayo Clinic diet; b) The Mayo diet plus nutrition counseling; and c) the Mayo diet plus counseling and behavior modification. The results of this test showed that plan (c) was most effective, followed by plan (b), followed by plan (a). The development of new methods to achieve and maintain dietary change is

part of the NHLBI's fundamental research program in behavioral medicine. Much more needs to be learned on the best way to achieve dietary change, not only in those persons at high risk for cardiovascular disease, but for all persons nationwide.

A major objective of efforts in nutrition education research by NCI was to determine how much of the information obtained on diet and cancer can be used to educate the general public, the medical practitioners, and the scientific community. Innovative methods to provide such useful information as dietary guidelines were pursued as well as special efforts to develop education materials on diet and nutrition for use in primary and secondary schools.

In the Clinical Nutrition Research Centers throughout the country, research and patient care are combined with education in the form of community outreach programs and opportunities for medical professionals to study and receive practical experience in cancer and nutrition. Clinical centers help to bring the state-of-the-art research from the laboratory to the practicing physician and thus improve patient care.

III

NUTRITION COORDINATING COMMITTEE

COMMITTEE STRUCTURE

The Nutrition Coordinating Committee (NCC) operates out of the Office of the Director and is advisory to the Director, NIH. The membership of the NCC consists of representatives from the 11 Institutes and the Division that support nutrition research. Additional NIH offices, other agencies of the Public Health Service and the Department, and the Office of Science and Technology Policy in the Executive Office of the President have liaison representatives to the Committee. As of September 30, 1979, the NCC was composed of 2 officers, 23 members and alternates, 11 liaison representatives and alternates from interested offices within the NIH, and 10 liaison representatives and alternates from other Federal agencies (see pages iii, and iv).

The Committee, established in 1975, reviews and comments on the plans, execution, and results of pertinent Bureau, Institute, and Division research efforts relating to nutrition in order to develop the annual Report of the NIH Program in Biomedical and Behavioral Nutrition Research and Training. In addition to staffing the NCC, the Office staff provides information requested by the Office of the Director, and represents NIH in numerous activities involving nutrition research at DHHS, the Office of Science and Technology Policy, other Federal and non-Federal agencies, industry, and professional societies. The NCC Office also maintains information on national and international nutrition meetings and conferences.

NCC meetings are normally held once a month and are attended by the members, liaison representatives, and Committee Office staff. In addition to the regular business of the Committee, special presentations on subjects of current interest to the NCC are frequently made by scientists from other agencies or groups. Plans for FY'80 include the presentation, during one hour of each meeting, of Special Scientific Seminars by Intramural and visiting scientists engaged in nutrition research at the NIH.

MANDATE OF THE NIH NUTRITION COORDINATING COMMITTEE

The Nutrition Coordinating Committee:

- Reviews and comments on the plans, execution, and results of pertinent Bureau, Institute, and Division research efforts relating to nutrition in order to develop the annual Report of the NIH Program in Biomedical and Behavioral Nutrition Research and Training.

- Processes and responds to incoming requests for nutrition information from the DHEW and other Federal agencies, the Executive Branch of the Government, the Congress, outside institutions, and the public.

- Maintains up-to-date information on funding and on intramural and extramural research and training activities in nutrition.

- Develops and monitors means for improving the coordination of these activities.

Within the scope of the major activities described above, the NCC has the following specific functions:

- To define nutrition research at the NIH. (Accomplished, see page 5)

- To develop a policy statement for research and training in nutrition at the NIH. (Accomplished, see page 5)

- To establish information exchange. Each representative presents to the NCC any new plans, activities, conferences, and workshops that are concerned with nutrition. Future workshops and conferences are discussed to ensure full participation of all relevant Institutes; when many Institutes are involved, the NCC sponsors or co-sponsors such workshops or conferences. Through the information exchange mechanism, the NCC identifies areas of collaboration for further research. The NCC informs the NIH nutrition community of all meetings, both within and outside NIH, concerned with nutrition. The Committee also reviews and comments, if requested, on nutrition reports generated by the NIH and by other Federal and non-Federal agencies.

- To develop a data retrieval system for research and training in nutrition. (Accomplished, see page 7)

- To review proposed legislation and regulations. The NCC develops mechanisms for receiving, reviewing, and distributing information on proposed legislation affecting nutrition policy.

- To develop and maintain effective liaison with other departments and agencies that have nutrition activities. The NCC assesses existing liaison mechanisms and identifies those departments and agencies requiring a liaison relationship. Liaison representatives provide information to the NCC.

- To encourage the application of nutrition research to practice. The NCC members identify research data that are ready for "technology transfer" and promote the appropriate application of new knowledge in nutrition.

- To promote the dissemination of information for the purpose of public education on the role of nutrition on health and disease. The NCC assists in coordinating Bureau, Institute, and Division efforts in nutrition education and acts as a focal point for the dissemination of nutrition information to the public.

NCC SUBCOMMITTEES

In addition to the Committee activities a number of special activities were carried out through two subcommittees: The Program Subcommittee and the Subcommittee on Nutrition Education.

A. The Program Subcommittee is chaired by the NCC Chairman. The Subcommittee draws its membership from the NCC representatives of the NCI, NEI, NIAID, NIAMDD, NICHD, and NCC Office staff.

The Charge of the Program Subcommittee is:

- o to develop the agenda for each NCC meeting
- o to formulate the report of the NIH Program in Biomedical and Behavioral Nutrition Research and Research Training
- o to develop Program Announcements
- o to consider nutrition conferences
- o to discuss the advisability of outside speakers at NCC meetings
- o to serve as a primary reviewer for nutrition applications submitted through the Fogarty International Center.

B. The Subcommittee on Nutrition Education includes representatives from various Institutes, the Clinical Center, and the Office of Communication. As of September, 1979, the membership of the Subcommittee consisted of: Dr. Artemis P. Simopoulos, Chairman; Ms. Ernestina Bou, Clinical Center; Dr. Barbara Gastel, NIA; Ms. Lorraine Kershner, NCI; Dr. Steven Zifferblatt and Ms. Jeanne Tillotson, NHLBI; Mr. Thomas Flavin, Mr. Gerald Hecht, Mr. Marc Stern, and Mr. Donald Ralbovsky, Office of Communication; Dr. Lorraine Boykin, Dr. Thomas Vogl, and Ms. Judith Coulter, NCC staff.

The Charge of the Subcommittee on Nutrition Education is:

- o To review NIH nutrition publications designed for the public
- o To develop public service announcements
- o To develop the NIH Newsletter on Biomedical and Behavioral Nutrition Research and Training (This activity is currently pending)

COMMITTEE ACTIVITIES AND ACCOMPLISHMENTS IN FISCAL YEAR 1979

Highlights Of The FY' 79 Nutrition Program

A major responsibility of the NCC is to identify areas for further research and bring them to the attention of the scientific community through the development and publication of Program Announcements (PAs), Requests for Applications (RFAs), and Requests for Proposals (RFPs). A PA is a formal statement of an NIH extramural research activity or of the initiation of a new or modified mechanism of support; it may describe new or modified program interests, or simply be a reminder of continuing interest. A RFA is a formal statement which (a) invites grant applications in a well-defined scientific area to accomplish specific program purposes; (b) generally identifies only one application receipt date, and (c) indicates whether or not funds have been set aside for the competition and, if so, the amount of funds and/or the expected number of awards to be made. A RFA may be reissued as necessary. A RFP is the Government's invitation to prospective offerors to submit a contract proposal based on the terms and conditions set forth in the RFP by the statement of work that describes the nature of intended procurement.

a. PAs, RFAs AND RFPs In Nutrition Research And Research Training Published In The NIH Guide For Grants and Contracts in FY'79

Table VIII lists the nine PAs, RFAs, and RFPs in nutrition, published in FY'79, with the date and origin of each announcement, the type of announcement, and its title. A brief description of each announcement follows the table. Included in the table are four PAs, two RFAs, and three RFPs.

TABLE VIII

PAs, RFAs AND RFPs In Nutrition Research And Research Training Published In The NIH Guide For Grants and Contracts in FY'79

ISSUED BY	DATE	TYPE	TITLE
NHLBI	10/16/78	RFA	"The Effect of Diet on the Metabolism, Structure, Composition, and Blood Levels of High Density and Other Lipoproteins"
NIAMDD NICHD NIAID NCI	10/16/78	Joint PA	"Research Grant Support in Nutrition," issued through NIH's U.S./ Japan Medical Science Program, and including the following areas for research emphasis:1) Environ-

TABLE VIII (continued)

ISSUED BY	DATE	TYPE	TITLE
			mental and host factor affecting nutritional requirements; 2) Iron deficiency; 3) Nutrition and Infection; 4) Effects of nutrition on physical and mental development, behavior, physical capability, and work performance; and 5) Health consequences of different (and changing) dietary patterns and food habits.
NCC [NHLBI, NIA, NIAID, NICHD, NINCDS, NIAMDD]	11/27/78	Joint PA	"Studies on Overnutrition and Obesity"
NICHD	1/19/79	RFP	"Prevalence and Impact of Nutritional Individuality"
NCC [NIA, NCI, NIAMDD]	1/26/79	RFA	"Core Grants for Clinical Nutrition Research Units (CNRUs)"
NICHD	2/2/79	RFP	"Metabolic Basis of Nutritional Individuality"
NICHD	2/16/79	RFP	"Nutritional Individuality and Dietary Patterns"
NCC [NHLBI, NIA, NIAMDD, NIDR, NINCDS, NEI, NCI]	9/26/79	Joint PA	"National Research Service Awards for Individual Postdoctoral Fellowships in Nutrition"
NCC [NEI, NHLBI, NIA, NIAMDD, NIDR, NIEHS, NCI, NINCDS]	9/26/79	Joint PA	"National Research Service Awards for Institutional Grants in Nutrition"

Description of Announcements:

The RFA, "The Effect of Diet on the Metabolism, Structure, Composition and Blood Levels of High Density and Other Lipoproteins", issued by the NHLBI, requests studies in the following areas: the effect of dietary perturbations on the composition, metabolism, and function of HDL, their apopro-

teins, and other lipoproteins or apoproteins; the chemistry of HDL apoproteins in relation to diet; the response of the circulating levels of HDL to various nutrient intake levels; relationship of HDL metabolism and HDL concentration in the circulation to specific components of the diet such as cholesterol, saturated and unsaturated fatty acids, and plant sterols; the effect of noncaloric dietary components (such as crude fiber and essential vitamins and minerals) on HDL levels and metabolism; the effects on HDL metabolism of complex versus simple carbohydrates; the relationship of weight gain or loss to HDL levels and metabolism; and the effects of diet on lipoprotein metabolism in animal models.

The Joint PA, "Research Grant Support in Nutrition", issued through the Malnutrition Panel of the NIH's U.S./ Japan Cooperative Medical Science Program supported by NIAMDD, NICHD, NIAID, and NCI for basic and clinical research related to nutritional problems and health of Asian people, identifies the following areas where research needs to be emphasized: environmental and host factors affecting nutritional requirements; iron deficiency; nutrition and infection; effects of nutrition on physical and mental development, behavior, physical capability, and work performance; and health consequences of different or changing dietary patterns and food habits. Studies should focus on the effect of motivation, stress, and cultural and social influences on dietary habits, food preferences, and behavior.

The Joint PA, "Studies on Overnutrition and Obesity", issued by the NCC and supported by NHLBI, NIA, NIAMDD, NIAID, NICHD, and NINCDS, solicits grant applications in basic, clinical, and behavioral research in exogenous obesity. The areas of research include: the heterogeneity of obesity; physiological and psychological factors that affect eating behavior; obesity (as a risk factor), energy balance, and change in metabolic rate as a function of age; fat cell control and proliferation; and weight management.

The RFP, "Prevalence and Impact of Nutritional Individuality", issued by NICHD, solicits epidemiological studies to establish the prevalence and types of nutritional individuality, and to determine the impact of such nutritional individualities on human development. Studies are to document the prevalence and impact on human development of specific food sensitivities and/or idiosyncracies of food metabolism identified during the developmental years of life (fetal life through adolescence); to evaluate contributing factors such as evolutionary, historical, geographical, anthropological, and ethnic background, as well as social and psychological determinants; and to identify critical time periods in the developmental years of life during which specific food sensitivities and/or idiosyncracies of food metabolism have the greatest potential of resulting in abnormal development.

The RFA, "Core Grants for Clinical Nutrition Research Units (CNRUs)", issued by the NCC with the participation of NIA, NIAMDD, and NCI, establishes a New National Program in Clinical Nutrition through the support and development of Clinical Nutrition Research Units (CNRUs). The CNRUs are described in detail on page 71 of this report.

The RFP, "Metabolic Basis of Nutritional Individuality", issued by NICHD, solicits biological studies designed to reveal the metabolic mechanisms

for abnormal responses (food sensitivity or idiosyncratic metabolism of a food) to a dietary staple that occur during the developmental years of life, and to develop and document a diagnostic procedure for identifying the specific food sensitivity or idiosyncratic metabolism of a food.

The RFP, "Nutritional Individuality and Dietary Patterns", issued by NICHD, solicits studies designed to test whether dietary patterns early in life are conducive to the development of food sensitivities, impair normal development and thereby increase the health problems in those individuals that have an idiosyncracy in their food metabolism. Studies are to test whether specific alterations in dietary patterns early in life: a) prevent the development, or lessen the impact, of food sensitivities on health problems, and b) improve the potential for normal development and thereby lessen the health problems in such individuals.

The Joint PA, "National Research Service Awards for Individual Postdoctoral Fellowships in Nutrition", issued by the NCC with the participation of NCI, NEI, NHLBI, NIA, NIAMDD, NIDR, and NINCDS, announces the continuing availability of support for research training in the areas of clinical and basic sciences as applied to nutrition. Under the Public Health Service (PHS) Act, the NIH makes awards directly to individual postdoctoral professionals or scientific applicants who are interested in careers in biomedical and behavioral research. The proposed study must encompass biomedical or behavioral nutrition research training with an opportunity to carry out supervised research, and must offer opportunity to research health scientists, research clinicians, etc., to broaden their scientific background or to extend their potential for research in health related areas.

The Joint PA, "National Research Service Awards for Institutional Grants in Nutrition", issued by the NCC with the participation of NCI, NEI, NHLBI, NIA, NIAMDD, NIDR, NIEHS, and NINCDS, announces the availability of support for research training in the areas of clinical and basic sciences as applied to nutrition. Under the Public Health Service (PHS) Act the NIH provides grants to eligible institutions for research training programs for pre and postdoctoral individuals, selected by the grantee institution, who are working toward careers in biomedical and behavioral research in nutrition.

b. Clinical Nutrition Research Units

As a means of encouraging the desired multidisciplinary approach to clinical nutrition opportunities and problems, the NIH fostered the development and operation of Clinical Nutrition Research Units (CNRUs). An RFA on CNRUs published jointly by NCI, NIAMDD, and NIA in January, 1979, led to funding of four such units in FY'79.

A CNRU is an integrated array of research, educational, and service activities that is oriented toward human nutrition in health and disease. It serves as the focal point for clinical nutrition research activities and for the stimulation of high quality research in areas such as nutritional health maintenance, improved nutritional support of the acutely and chronically ill, nutritional support of the hospitalized patient,

assessment of nutritional status, effects of disease states on nutritional needs, and effects of changes in nutritional status on disease. The CNRU is designed to provide the appropriate environment for the education of medical effects of changes in nutritional status on disease. The CNRU is designed students, residents, practicing physicians, as well as trainees and fellows in nutrition. Each CNRU provides support for a new investigator in clinical nutrition. At a minimum, a CNRU must comprise the following seven components: Research with human subjects and populations; Laboratory investigations; Research training; Shared facilities and research services; Education programs for medical students, house staff, practicing physicians, and paramedical personnel; Nutritional support services; and Public information activities.

The specific objectives of the CNRU are:

1. To create or strengthen foci in biomedical research institutions for multidisciplinary research in clinical nutrition in order to develop new knowledge about specific nutrients in health, human development, and the prevention and treatment of disease.

2. To strengthen training environments in order to improve the education of medical students, house staff, practicing physicians, and paramedical personnel in clinical nutrition.

3. To enhance patient care and promote good health by focusing attention towards clinical nutrition and generating nutritional information for the public.

In order to carry out these objectives, each CNRU is to include: professional personnel consisting of a leader who should be a scientist recognized for his or her expertise in research in clinical nutrition, at least two other associated senior investigators pursuing nutrition research, and other professional personnel as required, e.g. research pharmacists, dieticians, nurses, and technicians; laboratory facilities with clinical research laboratories for special nutrition related studies (e.g., metabolic, immunologic, endocrine, neuro-endocrine and behavioral research); a research training component to accomodate postdoctoral and new investigator training in clinical nutrition, and to provide opportunities for nutrition research training; educational programs that encourage the integration of nutrition education into other educational activities in relation to health promotion and disease prevention, curriculum development, education of house staff, continuing education of physicians and other health professionals, as well as provide information to the general public; nutritional support services for the assessment, maintenance and improvement of the nutritional status of patients in the hospital and at home; and public information activities to develop the appropriate mechanisms for the application of research knowledge, derived from the CNRU activities, into public education.

In FY'79 the following four CNRU's were funded:

The University of Chicago Clinical Nutrition Research Unit under the direction of Irwin H. Rosenberg, M.D., Professor of Medicine in the Department of Medicine. This CNRU is built upon the research base currently existing at the University for the study of diabetes, ischemic heart disease, atherosclerosis, urolithiasis, and cancer, and the programs in lipoprotein research, stable isotopes, and vitamin metabolism. Along with the resources of their nutrition support service and the biological sciences facility, this CNRU provides nutritional assessment, clinical intervention, laboratory assays, and support services to foster clinical investigation. [This CNRU is funded by NIAMDD]

The University of Wisconsin's Clinical Nutrition Research Unit is under the direction of Alfred E. Harper, Ph.D., Professor and Chairman of the Department of Nutritional Sciences and Earl Shrago, M.D., Professor of Medicine and Nutritional Sciences. The components of the CNRU will be particularly involved with a selected number of clinical programs including geriatrics, preventive cardiology, eating disorders, lipid disorders, cancer and nutrition, and dialysis. Integration of the components of the CNRU with these clinical programs is expected to provide a significant impetus to research and education in clinical nutrition as well as lead to a general improvement in clinical management and patient care. [This CNRU is funded by NIAMDD]

A Clinical Nutrition Research Unit at the University of Alabama in Birmingham is under the direction of Charles Butterworth, M.D., Professor and Chairman of the Department of Nutrition Sciences. The School of Community and Allied Health, the School of Medicine, and the School of Dentistry cooperate in this interdisciplinary program. Due to the strong institutional backing for a model Center for Clinical Nutrition Research, plans are underway for a Nutrition Science Center that includes an administrative unit and five other centralized units or teams consisting of: a laboratory to provide shared facilities for basic research and clinical support services; a clinical nutrition support team; an animal facility to support basic nutrition research; an information service to combat fraud, waste, and misinformation; and an international unit to promote understanding and exchange of information with students and scientists in other parts of the world. [This CNRU is funded by NCI]

The fourth CNRU, at Vanderbilt University's School of Medicine, is under the direction of Harry L. Greene, M.D., Associate Professor of Pediatrics and Head, Division of Gastroenterology. In keeping with the concepts of a CNRU, six clinical nutrition research projects serve as a focus in order to develop new knowledge about specific nutrients in health, human development, and in the prevention and treatment of disease. Ongoing fellowship training grants in nutrition and gastroenterology serve as a basis to implement much of the above teaching and patient care. The Vanderbilt Public Information office and their daily contact with the news media as well as with their own publication department will increase public awareness of the nutrition program. [This CNRU is funded by NIAMDD]

Many unanswered questions remain on the relationship of diet to health and disease, especially cancer, other chronic diseases, and aging. To answer these questions nutritional science must integrate many disciplines such as biochemistry, molecular biology, genetics, and physiology as well as medical specialties such as internal medicine, pediatrics, and surgery. A close interaction among research, health services, and education is crucial for the advancement of nutritional science. These four Clinical Nutrition Research Units are designed to provide maximal efficiency of research, service, and training through enhanced personnel contact and intellectual stimulation, use of shared resources, and coordinated effort. FY'79 marked the beginning of a New National Program in Clinical Nutrition Research. Over the next two years, the NIH hopes to fund an additional 4 to 6 CNRU's.

c. Conferences Sponsored by the NCC

The NCC mandate calls upon the NCC to sponsor conferences, workshops, and symposia in areas of nutrition research that are of concern to the Institutes.

1) Workshop on Nutritional Support of the Patient: Research Directions for the 1980's.

In order to define directions for research needed for the assessment of nutritional status of the hospitalized or institutionalized patient and to define the appropriate nutritional support therapy, the NCC, under the direction of Dr. Robert Edelman, Vice Chairman of the committee, held a workshop on "Nutritional Support of the Patient: Research Directions for the 1980's" on September 17-18, 1979. The purpose of the workshop was to identify and develop research priorities for program planning by the NIH with a focus on feeding patients by means of enteral and parenteral nutrition support. The workshop consisted of an opening lecture entitled "A Clinical Review: Why Do Patients Become Malnourished, How Do We Recognize It, And What Can We Do About It," and six panels representing the major disease or problem areas that clinicians face when caring for sick patients. The position papers of each panel were presented by: Dr. Edward M. Copeland, Cancer; Dr. Khursheed N. Jeejeebhoy, Gastro-Enterology; Dr. Douglas W. Wilmore, Trauma and Infection; Dr. William C. Heird, Pediatric Problems; Dr. Josef E. Fischer, Liver and Renal-Cardiopulmonary Problems; and Dr. Robert H. Herman, Nutrient-Hormone Interactions.

The proceedings of the workshop will be published in The American Journal of Clinical Nutrition. The research recommendations will provide the basis for the expansion of research on the nutritional support of the patient through the development of Requests for Applications (RFA's) and Requests for Proposals (RFP's) to be issued by the NCC.

2) Planned Conference on the Assessment of Nutritional Status

Late in FY'79, the NCC began to plan for "The Conference on the Assessment of Nutritional Status" to be held in the fall of 1980 and co-sponsored by the NIH-NCC, the Food and Drug Administration, and the Center for Disease Control. The purpose of the workshop is to review the state of the art and current research on nutritional status in order to better define the most appropriate methods of assessing the Dietary Intake and Nutritional Status of hospitalized patients and normal populations through surveys. An organizing committee, consisting of representatives from the sponsoring Agencies, was established to plan the program.

IV

THE NCC OFFICE

ACTIVITIES OF THE NCC OFFICE

As in past years, in addition to staffing the NCC and its two Subcommittees, the NCC Office responded to a great number and variety of requests for information on nutrition and the NIH nutrition program from the Congress, other Federal agencies, the scientific community, and the public. The major responsibilities of the NCC Office were: to compile and analyze the data on the NIH nutrition program in order to develop the Annual Report of the NIH Program in Biomedical and Behavioral Nutrition Research and Training; to collect and analyze data in preparing testimony and "special presentations" for the Office of the Director, NIH, and the Office of the Assistant Secretary for Health; to present the NIH nutrition program at national conferences and at meetings of professional societies; to assist the NIH Information Office with the preparation of press releases; and to provide input into DHHS nutrition activities. The NCC Chairman represented the NIH at the DHHS Nutrition Coordinating Committee and at the USDA-DHHS Informal Coordinating Committee's quarterly meetings. Furthermore the NCC Chairman cochairs and also serves as the Executive Secretary for the Joint Subcommitee on Human Nutrition Research (JSHNR) of the Office of Science and Technology Policy. The JSHNR first met in FY'79 as evidence of the increased interest in nutrition research in the Executive Office of the President, the White House.

Congressional Hearings, Reports, and Special Presentations on Nutrition

Requests for information on nutrition, nutrition research, and the NIH Program in Biomedical and Behavioral Nutrition Research and Training for which the NCC Office has prepared responses have come from a broad spectrum of sources: the Congress, the Office of Technology Assessment, and the General Accounting Office; the Executive Branch, including the Office of Science and Technology Policy, the Office of Management and Budget, and various agencies of the Public Health Service; as well as from the scientific community and the public. The central focus provided by the Office has undoubtedly facilitated NIH responses.

In order to expeditiously develop reports on each Institute's nutrition program and on the overall NIH Program in Biomedical and Behavioral Nutrition Research and Training, the NCC Office developed a computer aided system for data retrieval on all nutrition research and training activities in the extramural and intramural programs at the NIH. This computerized data retrieval system is described on page 7.

a. FY'79 Congressional Hearings

The NCC Office collects and analyzes substantial data for the preparation of testimony to be presented at Congressional hearings concerned with nutrition. In FY'79 the NCC Office helped to prepare testimony for the Deputy Assistant Secretary for Health Promotion and Disease Prevention and for the Chairman of the NCC for the hearings held September 25, 26, and 27, 1979, on "Nutrition Research Methods and Technology" before the Subcommittee on Science, Research, and Technology of the House of Representatives Committee on Science and Technology. The oversight review focused on the development of the science base necessary to formulate nutrition policies related to nutrient toxicity, bioavailability, and interactions; to food composition, dietary status, and nutritional status; and to the monitoring of the food supply. The DHHS panel included Dr. J. Michael McGinnis (OASH), Dr. Artemis P. Simopoulos (NIH), Dr. John Vanderveen (FDA), Mr. Robert Murphy (NCHS), and Dr. J. Michael Lane (CDC).

b. Official Reports

The NCC Office has provided input for reports prepared by other Federal agencies, as well as the General Accounting Office. In FY 1979, the Office supplied data used in the preparation of the following four documents:

"The Use of Nutritional Supplementation During Cancer Treatment at the National Institutes of Health Clinical Center and Selected Teaching Hospitals," prepared by the General Accounting Office, presents the state-of-the-art of total parenteral nutrition (TPN) at the Clinical Center and at The New England Deaconess Hospital, Boston, Massachusetts, the M.D. Anderson Hospital, Houston, Texas, and the University of Pennsylvania Hospital, Philadelphia, Pennsylvania.

"Federal Food, Agriculture, and Nutrition Programs" (FANI), developed by The General Accounting Office in cooperation with the USDA and the Office of Management and Budget, is an inventory report of 359 federal programs in 28 different departments and agencies.

"The DHHS-Nutrition Information and Education Inventory," compiled by the DHHS-NCC Subcommittee on Nutrition Education, lists DHHS activities in the following three areas: nutrition education and information provided to the public; training programs for health professionals in the field of nutrition; and research in nutrition education.

"The Moyer Report on the NIH Program in Biomedical and Behavioral Nutrition Research and Training", prepared by the NCC Office and the NIH Office of Communications at the request of the Labor-DHHS Appropriations Subcommittee of the House of Representatives, includes the financial obligations in nutrition of the PHS (NIH, FDA, CDC, HRA) and the Office of Human Development (AOA) along with a description of each Agency's nutrition program.

In FY'79, USDA and DHHS established a joint task force to develop dietary guidelines for the public. The NCC office, with comments from some of the NCC members, played a major role in contributing to the drafts of the guidelines so that a statement based upon the scientific state-of-the-art of nutrition could be made available to the public. The joint DHHS-USDA publication, Nutrition and Your Health; Dietary Guidelines for Americans, was issued March 1980.

c. Special Presentations, Seminars and Sessions

Throughout the year, the NCC Chairman and Office staff presented the NIH Program, and special presentations on nutrition, at the invitation of professional societies and other groups.

The NCC Chairman participated in the panel on "Nutrition and Government" at the Third Clinical Congress of the American Society for Parenteral and Enteral Nutrition (ASPEN) held in Boston, Massachusetts on February 3, 1979. The proceedings of this Congress were published by the American Society for Parenteral and Enteral Nutrition in March, 1979.

On April 12, 1979, the NCC Chairman participated in the panel, Opportunities for Support of Nutrition Projects", at the Liaison Officers Meeting, the Office of Federal Programs, of the American Association of State Colleges and Universities held in Washington, D.C.

The NCC Chairman participated in the panel on "The Role of Nutrition Research in Health and Disease" as part of the Stokely Van Camp, Inc. Annual Symposium, "Food in Contemporary Society", held at the University of Tennessee at Knoxville on May 21-23, 1979. The symposium emphasized nutrition, prevention, and public policy. The proceedings of the symposium were published in September, 1979.

The NCC Chairman participated as a member of the working group on Prevention Objectives in Nutrition at the DHEW sponsored National Conference on Prevention Objectives held in Atlanta, Georgia on June 12-14, 1979.

On August 29-31, 1979, the NCC Chairman spoke on "Evolutionary Aspects of Genetic - Nutritional Interactions" at the Satellite Symposium of the Seventh International Meeting of the International Society for Neurochemistry on "Genetic Approaches to Neurobiology and Neurobiological Disorders", held in Patras, Greece. The symposium attempted to bring together experts from the different scientific disciplines that apply genetics to neurobiological problems. A summary of the Satellite Symposium was published in Nature Vol. 281, 1979.

Other NCC staff presented the NIH Biomedical and Behavioral Nutrition Research and Training Program in July, 1979, to graduate students in public health nutrition from the School of Public Health, University of North Carolina at Chapel Hill as part of an orientation

program arranged by the HSA/PHS on nutrition activities in the Public Health Service, USDA, the Congress, and private Washington based organizations.

Foundation For Advanced Education in the Sciences

As part of the 1979 spring semester of the Foundation For Advanced Education in the Sciences (FAES) Graduate School at the NIH, Dr. Lorraine Boykin, Expert Appointee in Nutrition Education in the NCC Office, designed and taught a three credit course, entitled "Nutrition In Nursing". The course was designed for R.N. nurses interested in understanding the relationship of nutrition principles to nursing in the maintenance of optimal health and in the treatment of disease. Lectures on the following topics were offered: nutrition findings at various stages of man's life cycle; clinical features of specific diseases and their nutritional facets; and nursing diagnostic nutritional assessment techniques.

Science Writers Seminar in Nutrition

In order to provide the news media with background information on current research areas, the NIH periodically holds Science Writers Seminars. The Seminars serve chiefly as tutorials but may occasionally produce "news" or feature articles. The NCC Office and the NIH Division of Public Information organized the Science Writers Seminar on Nutrition Research held on November 9, 1979. The chairman of the NCC, was the moderator. Three NIH scientists presented their studies on human nutrition research. The presentations were: "Vitamin A: Vitamin, Hormone, or Both?" by Dr. Gerald J. Chader, Head, Section on Retinal and Corneal Metabolism, Laboratory of Vision Research, NEI; "Metabolism Studies with Isolated, Intact Small Intestine by Vascular Perfusion" by Dr. Herbert G. Windmueller, Research Chemist, Laboratory of Nutrition and Endocrinology, NIAMDD; and "Mineral Nutrition in the Premature Newborn" by Dr. James W. Hansen, Senior Investigator, Neonatal and Pediatric Medicine Branch, NICHD.

Politics of Nutrition and Public Health

In April, 1979, the NCC Office participated in "The Politics of Nutrition and Public Health" session of the NIH Staff Training Extramural Programs (STEP) Module No. 4 on "The Politics of Health: 1979 Update." The three-day module was made up of five sessions that emphasized major health-related topics of interest to the Congress and the public. The NCC Chairman assisted the module director, Dr. George J. Cosmides of the National Library of Medicine, in planning the session on "The Politics of Nutrition and Public Health" and the NCC chairman served as a faculty member and chairperson of the session. The session's panel consisted of Dr. Allan L. Forbes, Associate Director for Nutrition and Food Sciences, Bureau of Foods, FDA; Mr. Thomas P. Grumbly, Associate Administrator, Food Safety and Quality Service, USDA; Mr. Rodney E. Leonard, Deputy Director, U.S. Office of Consumer Affairs, the White House; Dr. Johanna Dwyer, Director, Frances Stern Nutrition Center, New England Medical Center Hospital; and

Mr. Christopher T. Hitt, Professional Staff Member, Subcommittee on Nutrition of the Committee on Agriculture, Nutrition and Forestry, U.S. Senate. The NCC Office will publish the proceedings of "The Politics of Nutrition and Public Health" in FY'81.

HealthWorks'79

The NCC Office, in consultation with representatives from the Office of Information, several Institutes, the FDA, and the professional community, contributed to the DHHS sponsored Health Fair, entitled "HEalthWorks '79". The four themes of the fair were Nutrition, Physical Fitness, Stress Management, and Living Habits and Safety. Each theme was presented through various activities in individual tents. The NCC Office, in cooperation with the NIH's Office of Communication and the FDA, was responsible for four of the activities in the Nutrition Tent:

- o The NIH Breakfast-Lunch-And-Dinner Theatre featuring "The Grocery Group"
- o The Eat Right Arcade
- o Fat City
- o Eat Hear Restaurant

The purpose of the Breakfast-Lunch-And-Dinner Theatre was to teach people prudent dietary choices through tape recorded menu selections reinforced by "The Grocery Group", a sing-along with actors giving sound nutritional advice. The lyrics developed for "The Grocery Group" incorporate nutrition principles for good eating practices at breakfast, lunch and dinner and emphasize "moderation" and "variety" as the theme.

The Eat Right Arcade consisted of a Nutrition Quiz with 50 questions about nutrition, while Fat City was the site of a small "fat cell" tent at which a person's lean-fat ratio was estimated by skin-fold caliper measurements, and materials on obesity and its control were distributed. At the Eat Hear Restaurant "patrons" selected a "meal" from a special menu and then listened to a taped message on the nutritional wisdom of their selection.

Due to the tremendous appeal of the NIH's nutrition contribution to "HEalthWorks '79", some of the materials were packaged for use in the field. The package included the lyrics and nutrition posters, as well as use of the costumes and staging of the sing-along "Grocery Group". The written lyrics for the NIH-NCC "Grocery Group" and some limited technical assistance are available through the NCC Office for use by any group interested in putting on the performance. This educational and entertaining show is being staged by local talent at various grade schools, community colleges, state and local health departments, and private organizations across the country.

NCC Office--Clinical Center Study on the Follow-up of Hypochloremic Formula Feedings in Infants

In July 1979, a kidney specialist reported three cases of metabolic alkalosis in infants who were being fed only Neo-Mull-Soy, a soybean based formula deficient in chloride, an essential nutrient. Epidemiological work carried out by CDC found an additional 118 cases of infants who had at least one episode of metabolic alkalosis while being fed either Neo-Mull-Soy or Cho-Free, another soybean based formula deficient in chloride. (Metabolic alkalosis is an accumulation in the body of organic base compounds, such as blood bicarbonate, resulting in the derangement of the normal acid-base balance.) Analysis of formula preparations found that the products contained one-third the chloride stated on the product label and supplied approximately one-fifth the chloride recommended for infants by the American Academy of Pediatrics. The formulas were voluntarily recalled after having been on the market for about 16 months. At the recommendation of the NCC Office, the NIH will begin a five year follow up study at the Clinical Center of infants fed Neo-Mull-Soy or Cho-Free.

A team of NIH investigators under the leadership of Dr. Van S. Hubbard of the NIAMDD, Pediatric Metabolism Branch, will evaluate the infants' present physical and developmental status to provide a basis for future comparisons. The four associate investigators are: Dr. Barry Bercu, NICHD, Dr. Charles C. Chang, NINCDS, Dr. Howard A. Moss, NIMH, and Dr. Artemis P. Simopoulos, Chairman of the NCC. Dr. Jose Cordero of the Bureau of Epidemiology of the Center for Disease Control, Dr. Allan L. Forbes of the Food and Drug Administration, and Dr. Frederic C. Bartter of Audie Murphy Memorial Veterans Administration Hospital serve as consultants to the study.

In accordance with NIH policy each child will be admitted to the study at the recommendation of their physician. The children will be admitted to the study either as inpatients or outpatients. The study protocol includes a complete physical, neurological and psychological examination along with detailed medical, social and dietary histories. Special tests have been selected in order to rule out other causes of metabolic alkalosis, especially Bartter's Syndrome, which has symptoms similar to those observed in these infants.

A few affected infants were studied by their own physicians during the most-severe phase of their illness. These infants will be admitted as inpatients for two weeks to determine how they respond to a low, but adequate sodium level in their diet. Investigators will also take special measurements to detect possible hormonal changes. None of the diagnostic tests will harm the infants and if any abnormalities are found, they will be further evaluated and treated.

Because only about 1 percent of the infants receiving the formulas developed hypochloremic metabolic alkalosis, the study will attempt to identify the factors that enhanced the infants' susceptibility to

developing this metabolic alkalosis. Periodic re-evaluations should reveal any long-term effects on growth and development of the metabolic alkalosis that resulted from ingesting only the chloride deficient formulas.

WHO/FAO Meetings

As in previous years, the NCC office through its Chairman participated in a number of Committee activities involving the World Health Organization (WHO) and the Food and Agriculture Organization (FAO) of the United Nations. In preparation for the Joint WHO/Unicef Meeting on Infant and Young Child Feeding held in Geneva, October 9-12, 1979, the NCC Chairman participated at various interdepartmental meetings and was one of the U.S. delegates to the meeting.

Similarly, the NCC Chairman participated at meetings for the preparation of papers for FAO sponsored meetings. At the meeting, "Canada/U.S Consultations on International Organization Affairs," held in August, 1979, the NCC Chairman represented DHHS for the preparation of the U.S. position papers for FAO. Representatives from the Department of State, the Department of Agriculture, and the Agency for International Development also participated. Plans for meetings of The FAO-World Food Council Fifth Ministerial Meeting, the FAO Program and Finance Committees, FAO Conferences, and the Committee on Food Aid Policies and Programs were discussed. The emphasis was on international cooperative approaches to the alleviation of hunger in less developed countries.

DHHS Nutrition Coordinating Committee

In FY'79 the Chairman of the NIH-NCC represented the NIH on the DHHS Nutrition Coordinating Committee (DHHS-NCC) and the NCC Office provided scientific input to each of the following four DHHS-NCC subcommittees: Dietary Guidelines; Nutritional Status Monitoring System; Nutrition Education; and International Health.

In response to P.L. 95-113, the Food and Agriculture Act of 1977, DHHS and USDA jointly submitted to Congress, in March, 1978, a proposal for establishing a Nutritional Status Monitoring System. The goal of the Nutritional Status Monitoring System is to enhance the health of the American people by establishing a national system which will monitor the nutritional status of the population, the nutritional quality of the food supply, and the effectiveness of food and nutrition programs. The Senate Labor-HEW Appropriations Subcommittee, in its report (S.R. 95-283, p.85) directed the Assistant Secretary for Health, DHHS, in consultation with USDA, to develop a plan for implementing the proposal on the Nutritional Status Monitoring System. The NCC Chairman served as Chairman of the DHHS-USDA working subgroup preparing the research component of the Implementation Plan.

The Joint Subcommittee on Human Nutrition Research (JSHNR), of the Federal Coordinating Council for Science, Engineering and Technology (FCCSET), Office of Science and Technology Policy (OSTP), Executive Office of the President.

The Committee on Health and Medicine (CHM) and the Committee on Food and Renewable Resources (CFRR) of the Federal Coordinating Council for Science, Engineering and Technology (FCCSET) established the Joint Subcommittee on Human Nutrition Research (JSHNR) because of the vital importance of the benefits from human nutrition research to the welfare of the American people and the world population, and the need for nutrition research efforts of the Federal agencies to be mutually reinforcing.

The JSHNR is cochaired by representatives from DHHS and USDA. The Chairman, NCC, is the DHHS representative and serves as Cochairperson and Executive Secretary of the Subcommittee. The Administrator, Human Nutrition Center, SEA/USDA, represents USDA on the Subcommittee and serves as Cochairperson. In addition to DHHS, USDA, and OSTP (ex officio), seven other agencies are represented on the Subcommitee: Department of Commerce, National Oceanic and Atmospheric Administration (DOC/NOAA); Department of Defense (DOD); Federal Trade Commission (FTC); International Development Cooperative Administration, Agency for International Development (IDCA/AID); National Science Foundation (NSF); and the Veterans Administration (VA). On March 11, 1980, the National Aeronautics and Space Administration (NASA) was asked to join the JSHNR.

The scope and the purpose of the Subcommittee are as follows:

Scope: The Subcommittee is concerned with: (1) all Federally supported or conducted research on nutrition with emphasis on human nutrition; and (2) professional personnel needs in nutrition research and education.

This includes:

- Basic physiological and biochemical mechanisms for the digestion, absorption, metabolism, and transport of nutrients; the role of food ingredients in human health and performance and in the prevention and treatment of disease.
- Nutrient composition of foods; the effects of storage, processing, and packaging; and the biological availability of nutrients in the foods at the time of consumption.
- Determinants of dietary practices and methods for educating the public about dietary practices.
- Food consumption patterns and nutritional status of the general population and of special high-risk subgroups within the population; evaluation of the nutritional impacts of various intervention strategies and public policies.
- The professional personnel to carry out research on human nutrition; training programs in nutrition research and nutrition

education in medical schools, dental schools, schools for allied health professionals, schools of nutrition, teachers' colleges, and schools of food and agriculture; nutrition education at the primary and secondary school level; and the manpower needs for education of the public.

Purpose: The purpose of JSHNR is to increase the overall effectiveness and productivity of research efforts in nutrition. In fulfilling this purpose, the Subcommittee will:

a. Improve planning, coordination, and communication among Federal agencies engaged in research on nutrition.

b. Develop and update plans for Federal research programs to meet current and future domestic and international needs for nutrition.

c. Collect, compile, and disseminate information on nutrition research.

d. Prepare reports describing activities, findings, and recommendations of the Subcommittee.

To assist the Chairman in carrying out the responsibilities of the Executive Secretary of the JSHNR, Thomas P. Vogl, Ph.D., joined the Office staff in March, 1979.

DHHS Health Research Plans and Initiatives...The Nutrition Research Initiative

In April 1978, the Secretary of the Department of Health, Education and Welfare, Mr. Joseph A. Califano, initiated a major review and reappraisal of the Department's health research activities and long term interagency research proposals. Each agency in the Department thereby identified their health planning activities and the significance of research within their specific mission statements.

In order to coordinate research planning and implementation, and thereby strengthen research, a steering committee consisting of representatives from the various agencies was established to define a number of health research initiatives. The initiatives were to focus on selected problem areas where mission needs of several DHEW agencies coincide with significant scientific opportunity. The health research principles approved by the Department in August 1979 were to serve as a basis in developing each initiative.

The NIH was designated as the sponsoring agency to develop the Nutrition Research Initiative, and the NCC Chairman was designated as coordinator. The agencies designated as cosponsors of the initiative were: The NIH-NCC; ADAMHA; FDA; CDC; the Office of Health Research Statistics and

Technology, NCHS-Hanes; and the Bureau of Health Manpower, HRA. The impetus to develop this initiative in nutrition stemed from the rapidly growing scientific interest, lively public debate on the pertinence of nutrition to particular health problems, and evolving federal efforts to coordinate nutrition research at both policy and program levels.

The purpose of the nutrition initiative is to develop within the DHHS a more comprehensive and effective program of nutrition research and training to strengthen support of related missions. The principle thrust is to reinforce a coherent research program and to extend the growing trans-Institute Cooperation in nutrition research to other agencies. A committee with members from the six agencies that support nutrition research and training will be given the task to develop a cohesive program for the Department in order to best carry out this initiative in nutrition research.

APPENDIX A

FY '79

Nutrition Expenditures by Institute and Division

Table A-1

National Cancer Institute
BIOMEDICAL AND BEHAVIORAL NUTRITION RESEARCH AND TRAINING -- FY '79
(in thousands of dollars)

Item		Breakdown Number	Breakdown Cost	Total Number	Total Cost
Extramural					
Research grants:	Regular	183	$ 9,628		
	Clinical trials	3	324		
	Total			186	$ 10,022
Program projects:	Regular	15	1,083		
	Clinical trials	1	67		
	Total			16	1,150
Contracts:	Regular	105	10,077		
	Clinical trials	19	2,227		
	Total			124	12,304
Centers:	Regular	27	1,912		
	Clinical trials	0	0		
	Total			27	1,912
Research support				0	0
Reimbursement agreements				5	782
Training:	Training grants	8*	129		
	Fellowships	3*	46		
	Total			11*	175
Research Career Development Awards				6*	191
New, Young, and Academic Investigator Awards				1*	33
Subtotal - Extramural					$ 26,569
Intramural					
Projects				25	1,734
Training				0	0
Subtotal - Intramural					$ 1,734
TOTAL NUTRITION RESEARCH AND TRAINING - NCI					$ 28,303

*Number of persons.

NCC-NIH 8-8-80

Table A-2

National Eye Institute
BIOMEDICAL AND BEHAVIORAL NUTRITION RESEARCH AND TRAINING -- FY '79
(in thousands of dollars)

Item		Breakdown Number	Breakdown Cost	Total Number	Total Cost
Extramural					
Research grants:	Regular	41	$ 2,340		
	Clinical trials	3	600		
	Total			44	$ 2,940
Program projects:	Regular	0	0		
	Clinical trials	0	0		
	Total			0	0
Contracts:	Regular	0	0		
	Clinical trials	0	0		
	Total			0	0
Centers:	Regular	1	12		
	Clinical trials	0	0		
	Total			1	12
Research support					0
Reimbursement agreements					0
Training:	Training grants	3*	28		
	Fellowships	3*	37		
	Total			6*	65
Research Career Development Awards				0*	0
New, Young, and Academic Investigator Awards				1*	36
Subtotal - Extramural					$ 3,053
Intramural					
Projects				8	512
Training				0	0
Subtotal - Intramural					$ 512
TOTAL NUTRITION RESEARCH AND TRAINING - NEI					$ 3,565

*Number of persons.

NCC-NIH 8-8-80

Table A-3

National Heart, Lung, and Blood Institute
BIOMEDICAL AND BEHAVIORAL NUTRITION RESEARCH AND TRAINING -- FY '79
(in thousands of dollars)

Item		Breakdown Number	Breakdown Cost	Total Number	Total Cost
Extramural					
Research grants:	Regular	146	$ 8,438		
	Clinical trials	5	1,817		
	Total			151	$10,255
Program projects:	Regular	11	1,454		
	Clinical trials	0	0		
	Total			11	1,454
Contracts:	Regular	14	462		
	Clinical trials	48	10,090		
	Total			62	10,552
Centers:	Regular	14	4,056		
	Clinical trials	0	0		
	Total			14	4,056
Research support				0	0
Reimbursement agreements				6	359
Training:	Training grants	78*	827		
	Fellowships	6*	64		
	Total			84*	891
Research Career Development Awards				3*	113
New, Young, and Academic Investigator Awards				7*	154
Subtotal - Extramural					$27,834
Intramural					
Projects				1	500
Training				1	81
Subtotal - Intramural					$ 581
TOTAL NUTRITION RESEARCH AND TRAINING - NHLBI					$28,415

NCC-NIH 8-8-80

*Number of persons

Table A-4

National Institute on Aging
BIOMEDICAL AND BEHAVIORAL NUTRITION RESEARCH AND TRAINING -- FY '79
(in thousands of dollars)

Item		Breakdown Number	Breakdown Cost	Total Number	Total Cost
Extramural					
Research grants:	Regular	30	$ 1,638		
	Clinical trials	0	0		
	Total			30	$ 1,638
Program projects:	Regular	2	261		
	Clinical trials	0	0		
	Total			2	261
Contracts:	Regular	0	0		
	Clinical trials	0	0		
	Total			0	0
Centers:	Regular	0	0		
	Clinical trials	0	0		
	Total			0	0
Research support				0	0
Reimbursement agreements				0	0
Training:	Training grants	0*	0		
	Fellowships	1*	14		
	Total			1*	$ 14
Research Career Development Awards				0*	0
New, Young, and Academic Investigator Awards				1*	47
Subtotal - Extramural					$ 1,960
Intramural					
Projects				1	668
Training				0	0
Subtotal - Intramural					$ 668
TOTAL NUTRITION RESEARCH AND TRAINING - NIA					$ 2,628

*Number of persons.

NCC-NIH 8-8-80

Table A-5

National Institute of Allergy and Infectious Diseases
BIOMEDICAL AND BEHAVIORAL NUTRITION RESEARCH AND TRAINING -- FY '79
(in thousands of dollars)

Item		Breakdown Number	Breakdown Cost	Total Number	Total Cost
Extramural					
Research grants:	Regular	19	$ 1,136		
	Clinical trials	0	0		
	Total			19	$ 1,136
Program projects:	Regular	1	35		
	Clinical trials	0	0		
	Total			1	35
Contracts:	Regular	1	34		
	Clinical trials	0	0		
	Total			1	34
Centers:	Regular	0	0		
	Clinical trials	0	0		
	Total			0	0
Research support				0	0
Reimbursement agreements				0	0
Training:	Training grants	0*	0		
	Fellowships	0*	0		
	Total			0*	0
Research Career Development Awards				0*	0
New, Young, and Academic Investigator Awards				0*	0
Subtotal - Extramural					$ 1,205
Intramural					
Projects				0	0
Training				0	0
Subtotal - Intramural					$ 0
TOTAL NUTRITION RESEARCH AND TRAINING - NIAID					$ 1,205

*Number of persons.

NCC-NIH 8-8-80

Table A-6

National Institute of Arthritis, Metabolism, and Digestive Diseases
BIOMEDICAL AND BEHAVIORAL NUTRITION RESEARCH AND TRAINING -- FY '79
(in thousands of dollars)

Item		Breakdown Number	Breakdown Cost	Total Number	Total Cost
Extramural					
Research grants:	Regular	403	$18,458		
	Clinical trials	1	20		
	Total			404	$18,478
Program projects:	Regular	5	1,642		
	Clinical trials	0	0		
	Total			5	1,642
Contracts:	Regular	1	0		
	Clinical trials	0	0		
	Total			1	0
Centers:	Regular	9	2,407		
	Clinical trials	0	0		
	Total			9	2,407
Research support				0	0
Reimbursement agreements				0	0
Training:	Training grants	54*	772		
	Fellowships	13*	173		
	Total			67*	945
Research Career Development Awards				10*	364
New, Young, and Academic Investigator Awards				0*	0
Subtotal - Extramural					$23,836
Intramural					
Projects				3	698
Training				24*	534
Subtotal - Intramural					$ 1,232
TOTAL NUTRITION RESEARCH AND TRAINING - NIAMDD					$25,068

*Number of persons.

NCC-NIH 8-8-80

Table A-7

National Institute of Child Health and Human Development
BIOMEDICAL AND BEHAVIORAL NUTRITION RESEARCH AND TRAINING -- FY '79
(in thousands of dollars)

Item		Breakdown Number	Breakdown Cost	Total Number	Total Cost
Extramural					
Research grants:	Regular	133	$10,202		
	Clinical trials	8	818		
	Total			141	$11,020
Program projects:	Regular	13	3,518		
	Clinical trials	3	195		
	Total			16	3,713
Contracts:	Regular	7	1,676		
	Clinical trials	2	88		
	Total			9	1,764
Centers:	Regular	14	1,424		
	Clinical trials	1	20		
	Total			15	1,444
Research support				2	45
Reimbursement agreements				0	0
Training:	Training grants	4*	87		
	Fellowships	7*	103		
	Total			12*	190
Research Career Development Awards				9*	324
New, Young, and Academic Investigator Awards				0*	0
Subtotal - Extramural					$18,500
Intramural					
Projects				9	1,907
Training				11*	399
Subtotal - Intramural					$ 2,306
TOTAL NUTRITION RESEARCH AND TRAINING - NICHD					$20,806

NCC-NIH 8-8-80

*Number of persons.

Table A-8

National Institute of Dental Research
BIOMEDICAL AND BEHAVIORAL NUTRITION RESEARCH AND TRAINING -- FY '79
(in thousands of dollars)

Item		Breakdown Number	Breakdown Cost	Total Number	Total Cost
Extramural					
Research grants:	Regular	14	$ 634		
	Clinical trials	0	0		
	Total			14	$ 634
Program projects:	Regular	1	64		
	Clinical trials	0	0		
	Total			1	64
Contracts:	Regular	2	81		
	Clinical trials	0	0		
	Total			2	81
Centers:	Regular	2	264		
	Clinical trials	0	0		
	Total			2	264
Research support				0	0
Reimbursement agreements				0	0
Training:	Training grants	12*	257		
	Fellowships	1*	15		
	Total			13*	272
Research Career Development Awards				2*	71
New, Young, and Academic Investigator Awards				2*	55
Subtotal - Extramural					$ 1,441
Intramural					
Projects				2	222
Training				0	0
Subtotal - Intramural					$ 222
TOTAL NUTRITION RESEARCH AND TRAINING - NIDR					$ 1,663

*Number of persons.

NCC-NIH 8-8-80

Table A-9

National Institute of Environmental Health Sciences
BIOMEDICAL AND BEHAVIORAL NUTRITION RESEARCH AND TRAINING -- FY '79
(in thousands of dollars)

Item		Breakdown Number	Breakdown Cost	Total Number	Total Cost
Extramural					
Research grants:	Regular	40	$ 1,759		
	Clinical trials	0	0		
	Total			40	$ 1,759
Program projects:	Regular	6	731		
	Clinical trials	0	0		
	Total			6	731
Contracts:	Regular	0	0		
	Clinical trials	0	0		
	Total			0	0
Centers:	Regular	6	740		
	Clinical trials	0	0		
	Total			6	740
Research support				0	0
Reimbursement agreements				0	0
Training:	Training grants	18*	166		
	Fellowships	0*	0		
	Total			18*	166
Research Career Development Awards				0*	0
New, Young, and Academic Investigator Awards				5*	144
Subtotal - Extramural					$ 3,540
Intramural					
Projects				0	0
Training				0	0
Subtotal - Intramural					$ 0
TOTAL NUTRITION RESEARCH AND TRAINING - NIEHS					$ 3,540

NCC-NIH 8-8-80

*Number of persons.

Table A-10

National Institute of General Medical Sciences
BIOMEDICAL AND BEHAVIORAL NUTRITION RESEARCH AND TRAINING -- FY '79
(In thousands of dollars)

Item		Breakdown Number	Breakdown Cost	Total Number	Total Cost
Extramural					
Research grants:	Regular	11	$ 817		
	Clinical trials	0	0		
	Total			11	$ 817
Program projects:	Regular	4	865		
	Clinical trials	0	0		
	Total			4	865
Contracts:	Regular	0	0		
	Clinical trials	0	0		
	Total			0	0
Centers:	Regular	3	945		
	Clinical trials	0	0		
	Total			3	945
Research support				0	0
Reimbursement agreements				0	0
Training:	Training grants	84*	290		
	Fellowships	2*	15		
	Total			86*	305
Research Career Development Awards				0	0
New, Young, and Academic Investigator Awards				1*	39
Subtotal - Extramural					$ 2,971
Intramural					
Projects				0	0
Training				0	0
Subtotal - Intramural					$ 0
TOTAL NUTRITION RESEARCH AND TRAINING - NIGMS					$ 2,971

*Number of persons.

NCC-NIH 8-8-80

Table A-11

National Institute of Neurological and Communicative Disorders and Stroke

BIOMEDICAL AND BEHAVIORAL NUTRITION RESEARCH AND TRAINING -- FY '79

(in thousands of dollars)

Item		Breakdown Number	Breakdown Cost	Total Number	Total Cost
Extramural					
Research grants:	Regular	55	$ 1,746		
	Clinical trials	5	237		
	Total			60	$ 1,983
Program projects:	Regular	3	47		
	Clinical trials	0	0		
	Total			3	47
Contracts:	Regular	1	20		
	Clinical trials	0	0		
	Total			1	20
Centers:	Regular	9	216		
	Clinical trials	5	39		
	Total			14	256
Research support				0	0
Reimbursement agreements				0	0
Training:	Training grants	0	0		
	Fellowships	0	0		
	Total			0	0
Research Career Development Awards				0	0
New, Young, and Academic Investigator Awards				0	0
Subtotal - Extramural					$ 2,306
Intramural					
Projects				0	0
Training				0	0
Subtotal - Intramural					$ 0
TOTAL NUTRITION RESEARCH AND TRAINING - NINCDS					$ 2,306

NCC-NIH 8-8-80

Table A-12

Division of Research Resources
BIOMEDICAL AND BEHAVIORAL NUTRITION RESEARCH AND TRAINING -- FY '79
(in thousands of dollars)

Item		Breakdown Number	Breakdown Cost	Total Number	Total Cost
Extramural					
Research grants:	Regular	0	$ 0		
	Clinical trials	0	0		
	Total			0	$ 0
Program projects:	Regular	0	0		
	Clinical trials	0	0		
	Total			0	0
Contracts:	Regular	0	0		
	Clinical trials	0	0		
	Total			0	0
Centers:	Regular	0	0		
	Clinical trials	0	0		
	Total			0	0
Research support				1	13,381
Reimbursement agreements				0	0
Training:	Training grants	0	0		
	Fellowships	0	0		
	Total			0	0
Research Career Development Awards				0	0
New, Young, and Academic Investigator Awards				0	0
Subtotal - Extramural					$ 13,381
Intramural					
Projects				0	$ 0
Training				0	0
Subtotal - Intramural					$ 0
TOTAL NUTRITION RESEARCH AND TRAINING - DRR					$ 13,381

NCC-NIH 8-8-80

APPENDIX B

Mission Statements Of the NIH Institutes and DRR

MISSION STATEMENTS IN NUTRITION
BY INSTITUTE AND DRR

Biomedical nutrition research supported by the NIH encompasses the role of nutrients on human growth and development, health maintenance and promotion, disease prevention, and disease treatment. The specific mission statements in nutrition for the individual Institutes and the Division of Research Resources are the following:

NATIONAL CANCER INSTITUTE

The NCI supports extensive research on the relationship between cancer and nutrition in a wide variety of areas: basic cellular mechanics, etiology, prevention, epidemiology, therapy, rehabilitation, research development, and information dissemination. Each of the Divisions of the NCI, including the Office of the Director, funds a significant number of projects in nutrition and cancer research.

Resource development projects funded through the NCI's Office of the Director aim toward developing and standardizing new and more accurate methods of determining nutritional status.

The Division of Cancer Biology and Diagnosis supports basic research into the manner in which cell growth, differentiation, function, and transformation are affected by the absence or excess of various dietary factors, as well as the nutrient requirements of various types of neoplastic cells.

Through the Division of Cancer Cause and Prevention, the NCI funds a large number of nutrition and cancer epidemiology studies, along with studies that: investigate dietary components to determine if they can act as promoters or inhibitors of carcinogenesis; test the use of nutrients and/or their analogs in cancer prevention among high-risk groups; and attempt to identify and ameliorate the effect of naturally occurring dietary components, which can act as mutagens and carcinogens.

Research supported by the Division of Cancer Treatment is directed toward the determination of whether nutritional support before or during various forms of cancer therapy can alleviate the side-effects of such therapy, allow more intensive therapy to be given, and improve the quality of life of cancer patients both during and after therapy. Additional studies are conducted to determine if dietary manipulation can be used to slow tumor growth, to identify the causes of anorexia, and to develop methods to prevent or alleviate the anorexia that severely compromises the survival of patients with cancer.

The Division of Cancer Control and Rehabilitation focuses on projects that aid the cancer patient in the recovery process. Such projects include the development of prostheses that allow for more adequate nutrient intake, digestion, and absorption, as well as projects to determine the best types and routes of nutrient intake during the rehabilitation process.

NATIONAL EYE INSTITUTE

Of particular interest to the NEI is the role of vitamin A in the development and functioning of the retina and cornea. The NEI's research interests include not only the role of vitamin A in normal ocular physiology but also how vitamin A relates to the blinding condition, keratomalacia, that is so prevalent in Central America, the South Pacific, the Indian subcontinent, and in other parts of the world. As research produces more knowledge about how vitamin A is handled in protein/calorie-deficient children and others who have been subjected to inadequate diets, it should be possible to design and evaluate--first in a clinical situation and ultimately under field test conditions--new approaches to vitamin A and protein supplementation that may prevent or at least reduce the severity of nutritional blindness. Toward this end, the NEI is actively collaborating with other Government agencies as well as the International Agency for the Prevention of Blindness, Helen Keller International, the World Health Organization and its affiliates, and other groups that are committed to improving public health throughout the world.

NATIONAL HEART, LUNG, AND BLOOD INSTITUTE

The NHLBI supports investigation on the social, environmental, behavioral nutritional, biological and genetic determinants and influences on the epidemiology, etiology, and prevention of all forms and aspects of heart, blood vessel, lung, and blood diseases.

Special emphasis is placed upon dissemination of information regarding diet, exercise, stress, cigarette smoking, and weight control.

NATIONAL INSTITUTE ON AGING

The NIA conducts nutrition research to: 1) better understand the nutritional requirements of the elderly; 2) determine relationships between nutrition and age, health, and disease; and 3) relate nutritional status to a variety of physical and biochemical variables influenced by age. With this program, the NIA intends to build the first comprehensive body of new knowledge on dietary intake, nutrient utilization, nutritional status, and the influence of these factors on the promotion and maintenance of optimal health in the aged. The results of such research will not only complement the research efforts of other Institutes in the area of nutritional influences as risk factors or contributors to disease states, but will also contribute greatly to the enhanced well-being of older Americans.

NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES

The NIAID is interested in promoting and supporting research in the broad field of nutrition, infection, and immunity. Specific interests focus on the modulating effect of specific nutrients on basic immune functions,

food allergies, and immune response to ingested antigens; the interactions of nutrition and infection in the tropical environment and in American hospitals; and the modulating effect of specific nutrients on microbial virulence.

NATIONAL INSTITUTE OF ARTHRITIS, METABOLISM, AND DIGESTIVE DISEASES

The nutrition program at the NIAMDD supports research and training in basic and clinical nutrition. It promotes research to advance knowledge about the functions and requirements of nutrients in the body, the relationships of diet and nutrients to health and disease, and the prevention and treatment of disease through the application of this knowledge. The NIAMDD emphasizes the following nutrition research areas: obesity, supportive nutrition, nutritional anemias, trace element nutrition, dietary fiber, metabolism and mechanism of action and interaction of nutrients, and factors that modify nutrition requirements.

Other programs--especially Diabetes, Metabolism, Digestive Diseases, Hematology, and Orthopedics--support nutrition research as it relates to these areas.

NATIONAL INSTITUTE OF CHILD HEALTH AND HUMAN DEVELOPMENT

The nutrition component of the mission of the NICHD is to advance knowledge on the role of nutrients in the promotion of health and well-being and the prevention and treatment of disease and disability.

The NICHD conducts and supports research and research training in nutrition as related to reproduction, pregnancy, infancy, childhood, and adolescence. Specifically, the NICHD seeks to determine the roles played by nutrition in: fertility and infertility; fetal development; maternal-infant relationships; and infant, child, and adolescent development.

Research is supported to develop new knowledge on nutritional deficiencies that may serve to predict disease and disability; interventions that may be applied to prevent and treat nutrition-related problems in utero, at birth, and in early life; optimal nutrient requirements for pregnant women and for infants; and the specific roles played by nutrients during growth and development, both physical and psychological.

The NICHD program of biomedical and behavioral research in nutrition emphasizes studies on developmental gastroenterology; childhood antecedents of adult disease; genetic-nutritional-environmental interactions; optimal maternal nutrition during pregnancy; the effects of infant feeding practices and infant nutrition on subsequent physiological, immunological, and personal development; and social and behavioral influences in childhood that may affect dietary and nutritional patterns throughout life.

NATIONAL INSTITUTE OF DENTAL RESEARCH

The mission of the NIDR in the area of nutrition is to improve the general oral health of the American population by reducing the severity of dental caries, periodontal disease, and other conditions of the oral-facial complex that are affected by various aspects of nutrition and diet. This mission is carried out through several approaches: 1) the conduct of basic research with emphasis on the systemic effects of nutrients as they relate to oral structures; 2) applied research that includes the study of the nature and composition of the diet, its local or topical effects, and its ultimate contribution to the prevention or reduction in severity of dental caries and periodontal disease; 3) training of individuals to participate in and/or conduct research as it relates to oral health; 4) demonstration projects that include identifying and developing agents and techniques to prevent dental caries and to promote the widespread acceptance and use of such agents and techniques by the public; and 5) the dissemination of available information to the public via various modes of communication.

NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES

The NIEHS is responsible for research on those chemicals comprising constituents of food that are pertinent to food safety and human health. These can be divided into two groups: 1) those present as naturally occurring components or contaminants; and 2) those added by man directly or indirectly in the course of food manufacturing, preparation, or during production (plants/animals).

NATIONAL INSTITUTE OF GENERAL MEDICAL SCIENCES

The NIGMS supports nutrition research directed to the discovery of better ways to prevent death from injury, mitigate pain, speed recovery of patients, and lessen the extent of disabilities caused by injuries. A better understanding of the total body response to trauma, including burns, is sought. This includes the biochemical and physiological changes induced by trauma and the fundamental aspects of wound healing and biological repair. Emphasis is given to nutrition research as it relates to treatment of post-traumatic infections, to the nutritional requirements of patients with burns, and to the rehabilitation of injured patients.

NATIONAL INSTITUTE OF NEUROLOGICAL AND COMMUNICATIVE DISORDERS AND STROKE

The NINCDS is responsible for studying and clarifying the two-way interaction between nutrient intake and activity of the central nervous system. The Institute's specific interests include the neural control of food intake; the enteral and parenteral factors that influence the onset or progress of neurological disorders; the metabolic effect of food and chemical substances on hereditary metabolic disorders that cause neurological abnormalities; the effects of protein and vitamin deprivation during fetal development and throughout life; the mechanisms to improve the transport of nutrients and drugs across the blood brain and blood

cerebrospinal fluid barriers; and the peripheral effects on nutrition of drugs used in central nervous system disorders.

DIVISION OF RESEARCH RESOURCES

Through its General Clinical Research Centers Program, the DRR supports research facilities, laboratories, professionals, nursing and dietary personnel essential to clinical investigation in nutrition. The General Clinical Research Centers (GCRCs) throughout the United States provide an effective resource for the interdisciplinary approach to study the clinical manifestations of American dietary patterns. The scope of nutrition research in the GCRCs includes obesity, diabetes, cancer, parenteral nutrition, hyperlipidemias, atherosclerosis, vitamins, and environmental health factors. Because of this large variety of projects, the GCRCs are instrumental in the integration of many disparate avenues of research resulting in the most effective methodology of health care. The General Centers relate to categorical centers for research in hypertension, diabetes, and cancer.

The team approach in clinical investigation allows the basic scientist, clinician, dietitian, and nurse to interact in developing a systematic methodology for nutrition research.

APPENDIX C

Legislative Authority of NIH for Human Nutrition Research

LEGISLATIVE AUTHORITY OF NIH FOR HUMAN NUTRITION RESEARCH

Two Institutes have specific mandates to conduct nutrition research at the NIH. Those mandates are as follows (references are to PHS Act):

NCI: Section 407(b)(4)--"Collect, analyze, and disseminate information (including information respecting nutrition programs for cancer patients and the relationship between nutrition and cancer) useful in the prevention, diagnosis, and treatment of cancer, including . . ."

NHLBI: Section 413(a)(1)--"investigation into the epidemiology, etiology, and prevention of all forms and aspects of heart, blood vessel, lung, and blood diseases, including investigations into the social, environmental, behavioral, nutritional, biological, and genetic determinants and influences . . ."

Section 413(d)--"There shall be in the Institute an Assistant Director for Prevention, Education and Control . . . In the conduct of such a program, special emphasis shall be placed upon dissemination of information regarding diet, exercise, stress, cigarette smoking, weight control . . ."

Other Institutes that conduct and support nutrition research do so under much broader authority. Each conducts research programs in the "diagnosis, prevention, and treatment" of specific diseases and life processes within their areas of responsibility. Those authorities are as follows:

General authority	Section 301
International cooperation authority	Section 307
Training authority	Section 472(a)(1)(a)
NCI	Section 402(a)
NHLBI	Section 412(1)
NIDR	Section 422(a)
NIAMDD	Section 434(c) Section 435(a) Section 439(a)
NICHD	Section 441(a)
NIGMS	Section 442
NIA	Section 464
Other Institutes	Section 431(b)

NCI LEGISLATIVE AUTHORITY FOR NUTRITION INFORMATION AND EDUCATION PROGRAMS

The specific mandates of the NCI for nutrition information and education programs are contained in Section 407(b)(4) of Public Law 92-218, "The National Cancer Act of 1971," as amended in Public Law 93-352, "Title I - Extension of Cancer Program":

> P.L. 92-218, Section 407(b)(4): "Collect, analyze, and disseminate all data useful in the prevention, diagnosis, and treatment of cancer, including the establishment of an international cancer research data bank to collect, catalog, store, and disseminate insofar as feasible the results of cancer research undertaken in any country for the use of any person involved in cancer research in any country."
>
> P.L. 93-352, Section 103: "Section 407(b)(4) of the Public Health Service Act is amended by striking out 'all data' and inserting in lieu thereof 'information (including information respecting nutrition programs for cancer patients and the relationship between nutrition and cancer).'"

NHLBI LEGISLATIVE AUTHORITY FOR NUTRITION INFORMATION AND EDUCATION PROGRAMS

The specific mandates of the NHLBI for nutrition information and education programs can be found in Section 413 of the Public Health Service Act, March 1977. This Section indicates the general plan for the Institute to expand, intensify, and coordinate the Institute's activities in the areas of heart, blood vessel, lung, and blood diseases and blood resources. To implement this mandate, Section 413(a)(1) states:

> "Investigation into the epidemiology, etiology, and prevention of all forms and aspects of heart, blood vessel, lung, and blood diseases, including investigations into the social, environmental behavioral, nutritional, biological, and genetic determinants and influences involved in the epidemiology, etiology, and prevention of such diseases."

Section 413(d) states the following:

> "There shall be in the Institute an Assistant Director for Prevention, Education, and Control who shall be appointed by the Director of the Institute. The Director of the Institute, acting through the Assistant Director for Prevention, Education, and Control, shall conduct a program to provide the public and the health professions with health information with regard to cardiovascular and blood and pulmonary diseases and blood resources. In the conduct of such program, special emphasis shall be placed upon dissemination of information regarding diet, exercise, stress, hypertension, cigarette smoking, weight control, and other factors affecting the prevention of arteriosclerosis and other cardiovascular diseases and of pulmonary and blood diseases."

*U.S. GOVERNMENT PRINTING OFFICE : 1980 O-341-132/3264

best copy available

NIH Publication
No. 81-2092
June 1980